Cliometrics Group, London School of Economics, 11 January 2008,

'The African Growth Evidence: Data Quality in East-Central Africa, 1965-1995'

Morten Jerven

M.Jerven@lse.ac.uk

1. Introduction:

This is an examination of economic growth in four African economies; Kenya, Tanzania, Botswana and Zambia. A review of the literature on data quality reveals that there is a considerable weight behind the argument of considering data on economic growth in Africa as poor, inadequate, unreliable, inaccurate and even random¹. This contention in the small literature on the field stands in a glaring contrast with the widespread use of the data as functional evidence for economic analysis. It is also further startling that there is an absolute lack of research trying to establish exactly how poor, inadequate, unreliable, inaccurate and random the state of the African growth evidence is.

Since the work of Blades was undertaken under the auspices of the OECD Development Centre the field has not been subject of thorough research.² That report was justified as "it is not possible to make intelligent use of the published statistics without knowing the estimation procedures used and the assumptions on which they are based" (1975:8). It literarily follows that since such care has not been taken, most academic work on economic growth in Africa has been unintelligent. That would perhaps be to draw the implication a bit too far. It might suffice to conclude that the subsequent research has not been properly informed.

It is the central aim of this thesis to amend this gap in the literature. Through a careful use of the growth evidence and its source material the thesis will give the best possible answer to how these four economies grew in the postcolonial period. This is done by consulting the available primary documents on national accounts estimation in the four case study countries.

Another and related aim of the thesis is to give an evaluation of the available growth evidence. Based on the reporting of WDI and Penn World Tables, one gets the impression that the growth evidence is reliable and valid. This is however not the case. The constant price growth series for 1960-2000 published by those sources are in fact based on discontinuous series, extrapolations over missing years and a great amount of guessing.

¹ The preceding chapter in the thesis.

 $^{^{2}}$ His 1975 study looked at the coverage and treatment of the subsistence (or non-monetary) sector in the national accounts for a range of developing countries. It was comparative, and thus broad in range, while only covering a part of the national accounts. Consequently the study could not reach any specific conclusions as regards the effect on the construction and use of a time series of growth data in a developing country.

The information is available through the published and unpublished reports prepared by the agencies responsible for the collection and dissemination of national accounts data. It is normal practice in scholarly work to use data on economic growth as published and readily available from World Development Indicators, Penn World Tables, the data produced by Maddison or other data series published by international organisations. The specific information and cautions from the national statistical agencies are lost on the way. These data are published without much information on direct sources or details on how the data has been reconfigured to form a constant price growth time series. These growth series are then used in various forms of analysis as primary evidence.

It may be helpful to illustrate the insertion point of this research with a diagram showing the structure of the argument. The regular approach in the literature is to acknowledge in a footnote, in the introduction or as a caveat in the conclusion that it is assumed that the data are good enough to reflect the real situation. The statistics are taken at face value as firm evidence which hopefully reflects the theoretical assumptions as to what the data mean. The initial point of analysis is different in this paper's approach as shown below.

My Starting Point

↓ The Real Economy → Statistics → Economic Analysis ↓ Mainstream Starting Point

The focus here is whether the quantitative evidence conveys the same information as it is theoretically assumed to contain. Specifically, as regards growth evidence, to what extent does the measure of economic growth reflect real growth in production in the country concerned, and to what extent is this percentage rate a result of guesswork, methodological change, statistical growth or other distortions. This issue has not been directly handled in the literature and as such it is hoped that this part of the study will represent real value added to the disciplines touching upon growth and development in Africa.

This study of the national accounts of Botswana, Kenya, Tanzania and Zambia seeks to bridge this gap of knowledge by reviewing how the information on economic growth is assembled into time series. There are several steps towards creating a constant price series of economic growth. Ideally, the series have to be comparable over time and space. In the literature they are treated as if they were. The cases where a comparison over time and/or space could be invalid are many. The comparison over space, that is comparing growth in one country with another, is constrained by the differences in methodology. In addition the comparison of one country with another expressed in currency terms creates difficulty. Initially expressed in current terms the problem is of expressing them in a comparable currency. In constant currency terms the problem is that the chosen base years (the year for which prices are held constant) differ from one country to another. The difference in methodology here will be shown to be important. The problem is further that a sector in one economy is estimated in different ways in each country. For instance in one country the growth in a specific sector (e.g. Trade) is enumerated on an annual basis, whereas in another country the same sector might be estimated to grow in accordance with a chosen variable (e.g. Agricultural output). In this specific example, the scholar would think he is comparing growth in the respective trade sector, but is in fact comparing trade in one country with agricultural output in another.

There are more issues to pay attention to when the comparison is done over time or when one is looking at year-to-year changes in economic growth. First, there is the general increase in prices, i.e. an inflationary effect. Second, there will have been changes in the quantity of production. Third, there are changes in the quality of production. Fourth, there are errors and omissions in some years, which may become apparent when a time series for a given item does not form a consistent series. Fifth, there have been changes to the methodology from year to year. Sixth and last, there are changes in coverage from year to year. The reported figures should ideally be adjusted for these effects. The last three instances mentioned would create statistical growth. The element of statistical growth can be huge in some years. The fundamental issue of comparing growth over time is the inflationary effect. In the countries in question the inflation has in some years been three digit and commonly double digit numbers. This means that the error margin in the reported constant price growth data can be significant.

This study is based on a research visit to the statistical offices of the four countries. In each country reports and handbooks on methodology have been collected. This information has been supplemented by consultation of the representatives of the respective central statistical offices. These visits have to some extent confirmed one expected problem of the statistical services – that of institutional memory. The officers I made contact with had without exceptions only been employed at the offices during the recent decade, and therefore knew not much more about practices in the period this study is looking at – the three decades after independence. There were, however, three concerns voiced at the offices, concerns that are not reflected in the dissemination and use of the growth evidence as practiced by the international organisations and the research community. These are worth mentioning immediately.

First, there is the issue of base years for constant price series. The series are reported as if they were continuous from 1960 to 1990. This does not correspond with either the practices or the recommendations of the statistical offices. In general effort has been made to change base year every ten year or so. If there is a growth series from 1970 through 1980 with 1972 as a base year, this series is not continuous and therefore not comparable with the growth evidence from 1969 with a different base year. In the internationally used statistical databases it is however treated as such. Second, and related to this first issue is the element of statistical growth. When the base year is changed, and so a new constant price time series is created, it normally coincides with the implementation of new statistical methods or changes in the use of basic statistical data – normally increased coverage. This means the comparison over time is further weakened. Again this caution is not reflected in the compilation of the growth series in the databases. Finally, while the first two issues were related to comparison over time for the individual country, the third concern regards the comparison over space. In response to direct questions both the Kenyan and the Tanzanian representative concurred that the comparison of annual growth rates of those two countries would be invalid. The problems of difference in base years and changes in methodology makes such a comparison meaningless if necessary precautions are not taken. It is worth illustrating this with an example. If hypothetically the Kenyan growth data took the boom year of the coffee price as the base year, while Tanzania took a slump year as a base year, this would affect the outlook of the evidence and therefore condition the conclusions reached. Similarly, if one compares a country that covers the growth in the informal sector in the early 1980s with a system of national accounts that does not, the analysis would be incorrect and the conclusions based on statistical artefacts not empirics.

This introduction should suffice to make readers aware of all the important issues regarding the growth evidence for African countries in general. Attention now turns to a specific analysis of the national account systems in the respective countries. The study will be conducted in a comparative fashion.

2. Four Sources of Growth Evidence

This section presents the available growth evidence on the countries. There is an abundance of different numbers in different publications which again have various editions. The official data is published by the respective national agency. There are also data distributed by international organisations. Finally, independent scholars have made imputations based on either of the mentioned sources or own estimates. Here four sources are considered. The official data as published by the national statistical agency, the World Development Indicators published by the

World Bank, the Penn World Tables and the OECD data .These are the most widely used sources and therefore the most relevant data.

The World Development Indicators indicates their sources as "World Bank national accounts data, and OECD National Accounts data files." GDP data is given in constant and current price in both local currency and in US dollars. The base year for the constant dollars is 1995. It is not indicated directly which year is taken as base year for the local constant GDP data. This can be derived from the respective GDP deflator. The deflator is implicit, meaning that it is the ratio of GDP in local current currency to local constant currency. Accordingly, the year when the ratio equals 1 and therefore the local and constant GDP data are equal, is the base year. For Tanzania GDP data are only reported from 1988 onwards. For the other three economies there are complete series from 1960 until 2001. The base year for the Tanzanian series (1988-2001) is 1992. In Botswana the base year is 1994, the same year chosen for the Zambian series. For Kenya the base year for the constant price series was 1982. These years correspond to the base year in the most recent official data series.

The Penn World Table reports that it uses almost the same base evidence as the WDI. The latest version PWT 6.2 is based on WDI 2002 for non OECD countries. For years and countries not covered in the WDI 2002 (applies to Tanzania) the data was obtained from previous national accounts files used in PWT5.6 and earlier versions. The reason why these data are preferred by many scholarly users is that The Penn World Table provides purchasing power parity and national income accounts converted to international prices. The steps required to express the national accounts in international comparable dollars will not be dealt with. For the purpose of comparison the derived growth rates are sufficient.

OECD has published the data produced by Maddison (1995, 2001, 2003)³. It gives growth data for all the countries in 1990 International Geary-Khamis dollars from 1950 to 2003. It has been stressed that despite the reporting of databases, the official growth series are discontinuous. This is because there are different base years for parts of the series, and because these changes in base year are associated with other changes in methodology. In the following the available official constant price data will be reviewed for each the countries separately. Building on that review the best available series will be compiled and compared to the data from the three other sources mentioned above. The metric of interest is annual growth, and this derived metric will compared as an annual percentage and in indices.

³ The data used here is downloaded from the OECD website. The data is produced at The Groningen Growth and Development Centre and is copyrighted to Maddison.

As noted the key difference between the official national accounts data, and the data available from the other databases is that the national accounts data is made up of discontinuous series. The availability of official constant growth data is described in the table below.

| Tuble 1 The Official Growth Evidence Tranable Constant Growth Series | | | | | | | | | |
|--|--|---|--|---|--|--|--|--|--|
| Botswana | | Kenya | | | Zambia | | | | |
| Coverage | Base Year | Coverage | Base Year | Coverage | Base Year | Coverage | | | |
| | | 1964- | | 1960- | | | | | |
| 1967/68;68/69;71/72 | 1964 | 1975 | 1960 | 1964 | 1965 | 1965-1971 | | | |
| | | 1972- | | 1964- | | | | | |
| 1966 - 1978/79 | 1972 | 1982 | 1966 | 1982 | 1970 | 1970-1976 | | | |
| | | 1972- | | 1976- | | | | | |
| 1973/74-1985/86 | 1976 | 1985 | 1976 | 1993 | 1977 | 1977-1995 | | | |
| | | 1977- | | 1964- | | | | | |
| 1974/75-1988/89 | 1982 | 2004 | 1985 | 1995 | 1994 | 1994-2005 | | | |
| | | | | 1987- | | | | | |
| 1974/75-1994/95 | | | 1992 | 2001 | | | | | |
| | Coverage 1967/68;68/69;71/72 1966 - 1978/79 1973/74-1985/86 1974/75-1988/89 1974/75-1994/95 | Kenya Coverage Base Year 1967/68;68/69;71/72 1964 1966 - 1978/79 1972 1973/74-1985/86 1976 1974/75-1988/89 1982 1974/75-1994/95 Kenya | Kenya Coverage Base Year Coverage 1967/68;68/69;71/72 1964 1975 1967/68;68/69;71/72 1964 1975 1966 - 1978/79 1972 1982 1973/74-1985/86 1976 1985 1974/75-1988/89 1982 2004 | Kenya Tanzania Coverage Base Year Coverage Base Year 1967/68;68/69;71/72 1964 1964- 1960 1966 - 1978/79 1972 1982 1966 1973/74-1985/86 1976 1977- 1974/75-1988/89 1982 1985 1974/75-1994/95 I I I I I I | Kenya Tanzania Coverage Base Year Coverage Base Year Coverage 1967/68;68/69;71/72 1964 1964- 1960- 1967/68;68/69;71/72 1964 1975 1960 1964- 1966 - 1978/79 1972 1982 1966 1982 1966 - 1978/79 1972 1982 1966 1982 1973/74-1985/86 1976 1985 1976 1993 1974/75-1988/89 1982 2004 1985 1987- 1974/75-1994/95 I I I 1992 2001 | Kenya Tanzania Zambia Coverage Base Year Coverage Base Year Coverage Base Year Base Year Base Year Base Year Incomparing the series of | | | |

Table 1 The Official Growth Evidence: Available Constant Growth Series

The differences between the series, and the different versions of them, as well as the underlying data will be discussed in detail in later sections. In this section, for the purpose of comparison with a growth series was compiled for the whole period, based on the different official series. When choosing which annual growth estimate to use the selection criteria is to use the estimate with the most up-to date base year.

As regards the agreement between the data series there are a few issues that complicates the comparison. These are important findings in them selves. The first to note is that the national statistical agencies does with the exception not publish own estimates of the time before independence. This means that a comparative growth analysis based on published national accounts can only be made from 1965 onwards. A second problem relating to the national accounts is that for Zambia and Botswana there are gaps in the constant growth series. In Zambia the new constant price series introduced in 1977 was not revised backwards, so there is direct data to compile constant growth rate for 1977. For Botswana the official data has gaps in the series between 1969 and 1973. Since the 1968 there is only made constant price estimates for the years 1971 and 1973, leaving annual growth estimates missing from 1968 until 1974. Finally, as mentioned in Tanzania WDI does not report any data before 1988. When plotting the derived annual growth data and GDP indices against each other, the data is presented with these gaps, and no attempts has been made to extrapolate for the missing years.

Before plotting the growth evidence, the different data sources for 1965 to 1995 are compared. In the case of Tanzania the comparison is only done for the three sources. In order to compare the correlation of the annual growth rates between 1965-1995, the data for the missing years in Botswana and Zambia has been extrapolated, assuming that the absolute increment in value added was smooth over the missing years. With these computations the reliability of the annual growth series from four sources (three in the case of Tanzania) can be compared.

This comparison is done with regards to how the annual growth rates agree with each other. At face value we have no criteria for choosing which of the series is the most correct one. This exercise is made to get closer to such a judgement. For instance if one of the four series are very different from the other three this could indicate that there is something wrong with that specific series. It was in the earlier data quality review referred to Blades who suggested a error margin of +/- 3 percent. That suggestion was made as a distinction between the growth rate as an outcome of national accounting practices at one side, compared to a *real* growth rate i.e. the actual economic growth in the economy. That perspective will be discussed at length at a later stage. At this point it is the extent of agreement between the main sources of evidence which is of interest. That being said, the extent of mismatch between these sources of growth is a powerful indicator of how accurate any given source of evidence is, and as such it tells us how much an annual growth rate is likely to convey meaningful economic information. It will further indicate whether it matters which growth evidence one uses, and for what kind of analysis it matter. The previous qualitative review of the growth evidence indicated clearly that it might be unwise to take any source of growth evidence at face value. The tables below presents a first indicative quantitative test of the coherence of the growth evidence.

 Table 2 Growth Evidence Correlations

| | WDI | PWT | OECD |
|----------|------|------|------|
| Botswana | 0.72 | 0.26 | 0.38 |
| Kenya | 0.54 | 0.27 | 0.78 |
| Tanzania | - | 0.13 | 0.78 |
| Zambia | 0.83 | 0.48 | 0.9 |

The table shows the correlation between the official data and the three other sources on annual growth rates. While the different sources growth evidence is in all cases positively related, the correlations are in all cases less than perfectly positively correlated, sometimes considerable so. 5 out of 11 times the correlations are closer to zero than to one, the average growth rate correlation between the official growth evidence and any other of the three sources if evidence being 0.55. This indicates that if one is interested in growth in any given year for one of these countries what one

finds can vary very much, depending on which source one has chosen. In particular the discrepancy between the Penn World tables and the official data appears to be large, while the other the data provided by the OECD and the World Bank correlates better with the official data. In terms of the general coherence between the national data and the other sources, there is no clear pattern except that the Zambia data coheres better.

In the table above the correlations are shown using the national accounts data as the reference data. On face value, we do not have any basis on which to tell whether one source of data is of better quality than another. It makes sense nevertheless, to use the national accounts data as the reference data. First of all because this data will be further investigated in the coming sections, and second of all, because this data is supposedly forming the basis for the data published in the other sources as well. The lack of correlation between the different sources of data indicates the extent to which the sources makes use of the official data, and the extent to which the imputations made on the data by the different data providers influence the coherence of the growth evidence.

Beyond the correlations shown in the table above, it is of interest to what extent annual growth reported by the other three different data providers correlate with each other. A hypothetical scenario would be that they agree well between each other, and that therefore it is the official data that is atypical. However, as the results in the table above indicates, the estimated growth rate in any given year also vary between the internationally renowned data providers. The highest correlation is observed between the OECD data and WDI on Zambia, with 0.92. The correlations in the growth data on Kenya (0.75) and Tanzania (0.53) are however lower. The WDI and PWT does agree to a considerable extent on Kenya (0.9), but the correlations on Botswana (0.47) and Zambia (0.61) shows that this is not a recurrent incidence of accuracy. The OECD and the PWT data are seemingly unrelated in the case of Kenya (0.31) and Tanzania (0.51) and Botswana (0.78).

To the extent that these correlations can form a basis for any conclusions it can said that based on these four case studies, one source of data cannot be said to better than another, and that if you are interested in a growth rate for any year, the answer you are given, depends very much on which data provider you choose. The agreement on growth in Tanzania is poor, in Botswana and Kenya it is so-so, while in Zambia it appears to be better.

Another way of measuring the degree of disagreement on economic growth in these four countries is to investigate the actual discrepancies in the data, and the timing of them. One angle to approach that issue is to look at the error range for any given year through the period.

Figure 1 Botswana: Annual Error Range in GDP Growth Rate



The data plotted in the figure above displays the maximum and minimum value of GDP growth quoted in any of the four sources for each year for 1966-1995. The differences between to two lines could be called the error range in the data. The average difference between the highest and the lowest estimate of growth in a year is very high, 8.5 percent, and not in any year do the four sources agree on the rate of growth. There are some lessons to be taken from the error range. First of all, it is higher at the beginning of the period. Between 1966 and 1977 it is 5 percent or higher in any year except in 1973, when the error range is only 2 percent, and only in two other years is it smaller than 10 percent in that period (6 and 5 percent in 1972 and 1968 respectively). In the latter half the error range narrows. Between 1978 and 1995 the error range reaches double digits three times 'only', in 1982, 1987 and 1988. From 1990 onwards the series are all using the same base year, and the error range average in this period is less than 3 percent. There are four periods in which the error range is particularly large. For the early years i.e. 1966-1971 this is particularly true with an average error of 14 percent. This is not that surprising given that there were no official growth estimates for which the series are based on for 1969 and 1970. The period between 1974 and 1977 was characterised by economic shocks both domestically and externally (drought and the petroleum prices) and the way the data has picked this up seems to differ. In particular the official data reports no or negative growth in 1974 and 1977, while the other sources indicate rapid growth. The timing of boom or bust seems to matter here. In the other two periods of large discrepancy 1981-1982 and 1987-1988 it is driven by relatively low estimates of growth by the Penn World Tables, while the other sources

report high growth. All in all, the range between the lowest and highest estimates is very large in the Botswana data. The coherence data are better as we approach current times.



Figure 2 Kenya: Annual Error Range in GDP Growth Rate

In the case of Kenya the average annual error range is lower, but still considerable at 4.6 percent. This high average is driven by a very large discrepancy in the data between 1970 and 1972. For these two years there is two competing versions of growth. If one trusts WDI or PWT, the economy shrank in 1970 (with a negative growth of 5 or 10 percent respectively) and then it grew at a very high rate through 1971 and 1972 (22 and 17 percent and 28 and 17 percent respectively. However, if one is more inclined to trust the official or the OECD data instead, the rate of growth was stable between 5 and 7 percent during those three years. There seem to be an error common to both WDI and PWT which explains the spike in the error range those years. The official data for Kenya has 1982 as a base year for its constant price series. This means that the weights are probably less correct for the late years, but since it has the same base year as the data from the other series the error range is narrower. Between 1980 and 1995, this range is only higher than 5 percent once (6 percent in 1983) and the data is very consistent between 1987 and 1994 when the error range is never larger than 2 percent. As indicated in the data correlation exercise earlier on, it is the PWT data that mostly is dictating the error range, and the second spike in 1979 is caused by PWT, when growth is reported as 13 percent, while the official and OECD data agree on a 4 percent growth. The lessons from the error range are that there are some errors common to the WDI and PWT series, but that since the base year of the official series has not been updated recently the error range is narrower in the earlier.



Figure 3 Tanzania Annual Error Range in GDP Growth Rate

In the case of Tanzania the average error range is 6 percent. That average is not evenly distributed, and in contrast with the other countries the discrepancies in the data is higher at the end of the period. The WDI does not report growth data for Tanzania before 1988, and just because this error range is based on three sources, and not four, this would normally have reduced the error range somewhat. As reported earlier the correlation between the PWT and the official data is very low, only 0.13, and it the difference between the PWT and the official data which drives the error range. The big discrepancies come in the late period. In 1987 PWT recorded a GDP growth of 20 percent with a negative growth of 33 percent in 1988. This is due to a mistake in the data, and also the reason why WDI does not report data before 1988. The growth recorded in 1987 was due to an inclusion of the informal sector. The decline recorded in 1988 was due to another statistical change in the data, this time a world bank mission judged that the agricultural and manufacturing estimates were too high. The PWT data for Tanzania are therefore not good enough, these large statistical errors in the data could easily be misinterpreted. The mistake does raise an important issue, which pertains to all African economies, but in our sample particularly to Zambia and Tanzania. There was shift in the 1980s towards market channels from state channels. This shift was in part due to reform as through structural adjustment programmes, and in part it was a result of the state failing to secure produce. The state was unable to offer reasonable prices for agricultural produce, and resources were not available to keep parastatal companies at the same level of activity. This meant a considerable challenge to the statistical agencies. There was a large structural shift from formal to informal activities and channels at the same time that the administrations were strapped for

resources. The statistical office, and later the database assemblers then faced a choice of reporting a dramatic reduction in economic activity as activity in the formal sectors reduced, or assume that this reduction in formal activity was compensated with a increase in the informal sectors. The mistakes in the PWT data derives from failing to keep up to date with the changing assumptions in the basic data collection in Tanzania in the late 1980s.



Figure 4 Zambia Annual Error Range in GDP Growth Rate

For Zambia the average annual error range is 3.6 percent, the lowest in our sample. It should be noted that the size error ranges can not be directly compared. The absolute size of the error range is to some extent dictated by the average growth rate, which is lower in Zambia. The gap in the series is increasing at the end of the period. Accounting practices changed in the late 1990s as a delayed response to a similar structural change as experienced in Tanzania, and the discrepancies in the data arising from this is clearly visible. The other years when the discrepancy was particularly large, 10 and 9 percent in 1970, and 1976, coincides with the change of base year in the official data.

In conclusion there are some common themes and some specific issues to highlight. In general the Penn World Tables seems to be more often out of tune compared to the other sources of data. Another general theme is that it is more likely that WDI and PWT has mistakes when there is a change of a base year in the official data. These two sources are evidently based on the official data series, but are at times not successfully harmonised over time. In the data on Botswana and Kenya there is observed a trend towards better agreement as one get closer to current times. This is presumably because the different sources does to a larger extent derive their data from the same sources. In the case of Zambia and Tanzania the onset of structural adjustment was far more disruptive both to economic structure and public administration resulting in a confusion of which sources to use compiling economic growth statistics.

The table below presents the differences in mean growth rates over the period. The range between the different sources estimates of growth over the three decades vary from 1.7 percent in Botswana, and 0.5 percent in Tanzania. This is the difference in the annual average growth rate. Translated to levels, a 30 year compound of 1.7 percent is about 66 percent, while the compound of 0.5 to 0.7 percent over 30 years equals to 16 to 23 percent. These are differences that matter in econometric analysis. For example, the typical value of the African Dummy varies between 0.6 to 1.2 percent in annual average growth rates.

| Average Growth | Official | WDI | PWT | Maddison | Error Range |
|----------------|----------|------|-----|----------|-------------|
| Botswana | 11.5 | 11.2 | 9.8 | 10.9 | 1.7 |
| Kenya | 5.2 | 5.3 | 5 | 4.7 | 0.6 |
| Tanzania | 3.7 | - | 3.4 | 3.2 | 0.5 |
| Zambia | 1.4 | 0.9 | 1.6 | 1.1 | 0.7 |

It would seem that Ward (1971:977) was correct in his classic statement that "many of the explanations advanced for differences in growth performance are far more impressive that the data which they purport to explain." A relevant example in the literature here is Durlauf et al (2005) who finds that typical phenomena among low income countries are negative 'output' shocks. The observed statistical error shock in Tanzania in the PWT data are among does on the 'top ten list' in that paper. This present research suggests that it might be worthwhile looking into more of these 'output' shocks, and check the robustness of the underlying evidence.

3. The National Accounts approach – Example of Botswana 1965-86

The advantages in using the national accounts data are many. Some of which has become evident above, bearing in mind the potential erratic mistakes in the data sets. Even in terms of average growth these mistakes matter, and for the purpose of this thesis, which aims to explain how these economies grew, it is essential. In the last section of this paper economic growth based on the national accounts in Botswana 1965-86 is examined.

The first decade of reporting in Botswana is messy. Consistent constant price reporting was not instituted until the 1979/80 report, and then GDP by type of activity was only provided back to 1973/74. This does not allow for a proper year-to-year account of growth in agriculture, manufacturing and mining and the other sectors respectively for the first decade of independence. The constant price series at 1974/75 prices only goes back to 1965. The 1964 estimate is not expressed in constant prices. The 1971/72 series (published in that year's report) does only cover three years, but in this series GDP per sector is given. These series together will give us a fair idea of how much the total economy grew, and which sectors of the economy contributed to the growth

during the first one and a half decade of independence. There is a gap in the series though, as there is no estimate corresponding to the years of 1969, 1970 and 1972. Also there is, as reviewed, considerable disagreement between the series. The most serious concerning the growth from 1973 to 1974 where the lowest estimate of growth was minus 7 percent, and the highest indicating an increase of 1 percent.

So, what happened in Botswana between 1965 and 1979? At 1974/75 prices the economy increased from P59⁴ million to P358.1 million. This corresponds to an approximate annual growth of 15 percent. The growth was markedly slower than this average in 1966, 1974 and 1976, when growth was 6 percent, negative one and half percent, and positive one and a half percent respectively. The implied annual growth rate from 1968 to 1971 is over 20 percent. This period of rapid growth is covered by the 1971-72 series. According to these data the GDP increased 99.3 percent from 1967 to 1971. This meant there was considerable expansion in the whole economy. Comparing each sector's value added in 1967 to that in 1971 shows that all sectors grew rapidly with the exception of 'subsistence' activities. 'Modern manufacture' grew 475 percent, but had only a share of 2.5 percent of the total GDP in 1967. To get a relative sense of the output growth it is better calculate each sector's share in the total increment in value added from 1967 to 1971. By this measure 56 percent of the growth is accounted for by Agriculture, Mining and Manufacturing. The brunt of this growth happens in the mining sector, which alone accounts for 28 percent. Agriculture accounts for 15 percent of the growth and manufacture 13 percent. The rest of the growth happens mostly in Government, Business services and Construction. The increase in the two latter sectors⁵ are attributable directly to mining activities, and the former partly due to increased revenues from the diamond production. This meant that about three quarters of the growth can be attributed to the development in mining. The remaining quarter of the growth was recorded in agriculture and manufacturing. Increases in both sectors was caused by cattle. The only enterprise in modern manufacture in Botswana at this time apart from the Government Printer was the abattoir of the Botswana Meat Commission. The national herd of cattle increased from one and half million to over two million in the period, and annual off-take increased from 140 thousand to almost 200 thousand.

The growth in agriculture was partly statistical. In 1971/72 the mark-up compensating for under-coverage was raised. Further, it was in this report considered that the numbers of traditional farmers previously had been 10 percent too low, and finally the sales of cattle from the traditional sector was considered to be 1/3 higher, than what was previously estimated. In total 10 percent more farmers, selling one third more cattle and a total number is arrived at using a 1.5 percent

⁴ Or from P55 million if one rather believes the estimates in the 1977/78 report.

⁵ The construction and business activities relating directly to the mines was transferred to these sectors according to the 1971/72 report.

higher mark-up accrues to almost a 50 percent statistical increase in output from the 1969 estimate to the 1971 estimate. The 1971/72 was in addition considered a good agricultural year, with plentiful rain, and it was considered unlikely that the size of the output would be reached the following year. 10 percent of the growth in value added over the period, derived from the Trade sector. The data for this sector is considered bad, and also contains an element of statistical growth (1971/72: 14). The small scale traders had not been covered in the earlier estimates, but as the result of a pilot study, R1.3 million was added to the 1971/72 estimate. This accounts for about one third of the growth recorded in this sector over the whole period.

The 1974/75 series allows for a longer view. As mentioned this series does not give breakdown of GDP by industry further back than 1973/74. This deficiency can be mended by assuming that the relative shares of GDP in 1965 would be the same at constant prices as at current prices. Taking this simplistic measure we can at least get some grasp of the contribution to growth by sector. From 1965 to 1979 there was a total increase in value added of P299 million, an increase of five times the GDP at the start of the period. The total value added deriving from agriculture almost doubled over the period. This contributed to 9 percent of the increase in total value added. The mining sector explains most of this expansion in value added with 28 percent of the increase to be attributed to that sector alone. The second largest contributor to this fivefold increase in GDP is the trade sector, accounting for 26 percent of the increase. In addition the finance sector and central government together accounts for a quarter, with 13 and 12 percent each respectively. The remainder of the increase is shared between the other sectors, with agriculture accounting for 9 percent and the other sectors between 2 and 4 percent.

Manufacture output tripled over the period, while agriculture doubled, both sectors growing slower than the rest of the economy. Over the same 15 year period the rural population increased 37 percent. This is not that impressive because there are further caveats to this agricultural growth. While 1965 was a very poor year due to climatic conditions, the 1979 output saw a windfall in crop production due to an end of drought. The manufacturing output is dominated by Botswana Meat Commission. There was also some new operators in the sector, in particular in brewing.

The above analysis is constrained by comparing two points in time (of which one is an approximation only), for the period between 1973/1974 to 1979/80 the full picture of economic growth by sector can be presented.

| | 1973/1974 | 1974/1975 | 1975/76 | 1976/77 | 1977/78 | 1978/79 | 1979/80 |
|-----------------------|-----------|-----------|---------|---------|---------|---------|---------|
| Agriculture | 68.9 | 61.2 | 62 | 64.6 | 61.8 | 58.9 | 53.6 |
| Mining | 17.9 | 18 | 32 | 33.7 | 62.7 | 57.8 | 84 |
| Manufacturing | 11 | 15.5 | 19.9 | 21.9 | 19.3 | 28.9 | 18.5 |
| Water and Electricity | 2.6 | 6.9 | 10.4 | 8.7 | 9.5 | 12.2 | 11.7 |
| Construction | 24 | 20.1 | 14.5 | 9.6 | 10.2 | 10.9 | 15.3 |
| Trade | 31.4 | 34.3 | 39 | 43.1 | 48.3 | 65.4 | 84.6 |
| Transport | 8.6 | 7.5 | 9.8 | 9.6 | 11.2 | 10 | 12.7 |
| Finance | 15 | 14.6 | 15.8 | 17.6 | 19.4 | 29.6 | 42.5 |
| Central Government | 25.3 | 24.9 | 31.1 | 35 | 35.1 | 39.3 | 39.7 |
| Community Services | 7.5 | 8.8 | 11.7 | 9.8 | 11.2 | 12.3 | 12.3 |
| Dummy Sector | -0.8 | -3.3 | -2.4 | -6.2 | -6.6 | -11.5 | -16.8 |
| Total | 211.4 | 208.5 | 243.8 | 247.4 | 282.1 | 313.8 | 358.1 |

The picture that emerges is quite similar to the one depicted above, namely that the economic growth in this period is mainly due to the mining development. The construction sector is indirectly associated with this development and reflects the efforts in building new mining complexes. The Selebi-Pikwe project was finished through 1973 and 1974, while the increase in the last year of the period reflects the new development of the Jwaneng, together with some statistical growth from a larger sample as is stated in the 1979/80 report.

The other sector that shows considerable growth is trade and finance. The diamond trade and sorting is accounted for in these sectors. This practice changes with the 1985/86 report, but for these years then, the growth in these sectors reflect the expansion in the mining sector. The growth in the water and electricity sector partly reflects that from the 1974/75 report onwards there is an effort to account for the electricity provision in the mining operations in this sector. It was warned in the reports that statistical growth in ISIC sectors 6, 7 and 8 (Trade, Transport and Finance) was 'particularly strong'(1975/76: 6).

The earlier prominent statistical growth in the agricultural sector ended with the 1974/75 report according to the Central Statistical Office. The agricultural sector had an absolute decline through the period. According to the same source 1973/74 was also a year with exceptional high rainfall. The climatic conditions were worse in the following years, and this is reflected in the growth pattern. 1978/79 was a year of drought and the crop produce was 'extremely small', because of the drought the Botswana Meat Commission received a record high amount of cattle for slaughtering. In 1979/80 the rains returned, and with it crop production revived. The throughput at the Botswana Meat Commission was reduced because farmers let the herds of cattle replenish.

The importance of the mining sector is manifested not only by its absolute contribution, and through other sectors. Note that in the years when value added in the mining sector does not increase significantly, that is in 1974/1975, 1976/77 and 1978/79, there is also no growth in total

GDP. It is appropriately summed up in the 1978/79 report as "the activities in the mining sector has enormous immediate implications on the value added in several other sectors" (1978/79: 4) In the 1968/69 report it is reported that "large fluctuations in agriculture will occur from year to year depending on rainfall patterns, and cannot be recorded as an indicator of growth" (1968/69: 17). We have also seen how the rainfall affects the cattle herd and how this influences growth in agriculture and manufacture with an inverse relationship.

The growth story in the first decade and a half of independence in Botswana can be summed up as follows. Behind the impressive aggregate growth was a massive increase in diamond mining and associated developments. The record of agriculture growth looks impressive in the first decade, but it is inflated by a low base year (due to climatic conditions) and strong statistical growth. Crop production does vary with rainfall, and shows no specific trend. There is a trend of growth in the cattle herd through that period, and the number of cattle does grow faster than the population. However, what matters most for economic growth is the off-take as this also determines growth in the manufacturing growth through BMC, and this reaches a plateau somewhere between 200 thousand cattle by 1972, and since then there is no clear trend of growth. The agricultural output data is presented below. As is warned earlier, the reliability of the data is weak. The crop outputs should be considered weak estimates only, but they display the point made above. The CSO considered the error margin of the cattle series to be about 300 thousand.





The next constant price series of growth was presented with the 1980/81 report. This series was also revised backwards to cover 1973/74, but there is no need to re-explain this period, so this series will be used to explain growth from 1980 until 1986 when a new series was introduced. There are slight changes in the evidence of growth in the 1970s with the new series, but the main trends in aggregate and by sector are maintained. The 1986/87 report presents the last estimate in 1979/80 prices, but in this year the whole series is revised backwards. The new Household Income and Expenditure Survey is incorporated so that the Agriculture, Trade and Finance sector is revised upwards. Agriculture output is revised upwards because of increased coverage and additions made for 'own consumption'. In the trade sector informal retail trade is added, and for the Finance sector there is an addition in the real estate sub-sector as improved data on renting of property is added. This means that there is positive statistical growth in all these sectors. The way the new data is added to series is that it is smoothened backwards. The increase in 1975/76 was P12.5 million, while in 1985/86 the addition was P22.5 million. As will be seen the original series showed that agricultural output was decreasing over the period, so this statistical measure understates the decline in the series.

The direct effect of the statistical growth in Trade and Finance is harder to pick out in the new series. This is because there was another important change with the data from the 1986/87 report. As mentioned earlier, in this report the mineral trade is now suddenly taken out of the Finance and Trade sector and transferred to the mining sector instead. Here the gradual approach of revising is taken as well, with an increasing amount transferred from the two sector, starting in 1977/78 and 1979/80 in Finance and Trading respectively. Because this transfer goes on simultaneously as there is statistical growth from the Household Income and Expenditure Survey flowing into these sectors, the end result is a bit confusing. A growth series loaded with statistical growth is to be avoided so the study of growth will use the 1985/86 series. This series will be more reliable as a measure of growth, but less valid as an indicator of total income. The effects of the

change in statistical procedures will shown afterwards. While the data in the new series from 1973/74 onwards are useless as indicators of growth, the difference between the 1985/86 estimate with the two methods can be indicative of the importance of diamonds in the Trade and Finance sector.

| | 1979/80 | 1980/81 | 1981/82 | 1982/83 | 1983/84 | 1984/85 | 1985/86 |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Agriculture | 83.3 | 75 | 71.8 | 60.1 | 50.9 | 46.8 | 53.2 |
| Mining | 210.7 | 260.6 | 222.1 | 393.3 | 533.4 | 560.2 | 573.2 |
| Manufacturing | 29.2 | 37 | 45.8 | 42.4 | 44 | 35.8 | 45.4 |
| Water and Electricity | 15 | 15.3 | 15.9 | 15.7 | 19.5 | 23.5 | 31.4 |
| Construction | 36.4 | 32 | 37.2 | 26.2 | 38.7 | 35.6 | 30.3 |
| Trade | 157 | 163.8 | 150.7 | 162.1 | 182.2 | 205.7 | 236.8 |
| Transport | 13.6 | 14.8 | 18.1 | 23.8 | 23.1 | 28.6 | 39.3 |
| Finance | 70.5 | 64.3 | 78.6 | 81.1 | 96.6 | 82.2 | 96.6 |
| Central Government | 100.6 | 114.2 | 123.8 | 136.1 | 150.5 | 172.5 | 186.2 |
| Community Services | 20.9 | 25.6 | 29.2 | 35 | 34.9 | 42.9 | 48.8 |
| Dummy Sector | -27.7 | -31.3 | -40.8 | -43.4 | -55.2 | -22.3 | -33 |
| GDP at constant market prices | 709.5 | 771.3 | 752.4 | 932.4 | 1118.6 | 1211.5 | 1308.2 |

There was negative growth in agriculture. This was due to the failure of rains in the early 1980s. There was no clear trend of growth in manufacturing, where the most apt description would be stagnation. The output in the end of the series in 1985 was at the same level as it was in 1978. There was a diversification in the sector, and BMC lost its dominant share. This was more due to the drought effects on cattle rearing than the dynamics of the rest of the manufacturing sector. With no new mining projects the growth in Construction stagnated. Still, the economy was growing at a impressive rate over the period as a whole. There was negative growth from 1980 to 1981 as the mining sector did not grow that year. The other years the steady growth in that sector secured Botswana's reputation as a rapid grower. The mining sector was in 1985/86 contributing more to value added than the total non-mining GDP in 1979, 1980, 1981 and 1982. Note that this is true even when the proceeds from diamond trading and sorting is still in the Trade and Finance sector respectively.



The production quantity in crops and cattle reflects the negative growth in the agricultural sector. Crop production decreased, and so did the national cattle herd. The output decrease in the sector was minimized by keeping the off-take high. The ratio of off-take to national herd size is stable through the 1965-1986 period, fluctuating between years of high off-take is related to diseases and drought, and low off take occurs after droughts to allow the herd to replenish. It would, in other words, be hard to argue that this is a variable easily affected by pricing policy.

As regards the new series released in the 1986/87, there was also a further statistical increase in the GDP as 'construction output was increased in line with the demand'. What this 'demand' refers to is hard to interpret, since there is no additional information given. The effect is certain though, the CSO retrospectively adding growth to the GDP. The changes in this sector together with the other that was affected by the revision is presented above. Note that the numbers are totals calculated by subtracting the annual estimates in the 1985/86 series from estimates in the 1986/87 series.

| | 1974/1975 | 1975/76 | 1976/77 | 1977/78 | 1978/79 | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|---------------|-----------|---------|---------|---------|---------|---------|---------|---------|---------|
| Agriculture | 12.5 | 12.6 | 13 | 18.5 | 11.7 | 17 | 15.5 | 20.5 | 20.7 |
| Mining | 0 | 0 | 0 | 0 | 0 | 29 | 60.8 | 158.8 | 164.1 |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | -0.9 | -1.6 | -1.6 | -1.8 |
| Construction | -0.1 | 13.8 | 18.8 | 32.4 | 26.2 | 21.7 | 25.6 | 4.2 | 7.6 |
| Trade | 0 | 0 | 0 | 0 | 0 | -9.3 | -25.3 | -19.6 | -40.5 |
| Transport | 0 | 0 | 0 | 0 | 0 | 3.5 | 2.8 | 1 | -2.4 |
| Finance | 0 | 0 | 0 | -4 | -9 | -11.8 | -16.6 | -25.3 | -24.9 |
| Dummy Sector | 0 | 0 | 0 | 3.9 | 9 | 12.9 | 14.6 | 23.8 | 23.5 |
| Total | 12.4 | 26.4 | 31.8 | 50.8 | 37.9 | 62.1 | 75.8 | 161.8 | 146.3 |

The table confirms that agriculture experiences a gradual statistical growth. This is growth is not in accordance with the growth pattern in the series. There are substantial amounts that are transferred to the mining sector, but they do not cohere with what is subtracted in Trade and Finance. This casts doubt about the accuracy of this series. The growth implication is that the decline in the 1980s is understated, and there seems to be the case that there is more growth added, then taken out from the transfer of the trade and sorting of diamonds. The total added value added is much higher in the low growth years. The growth implication from 1980 to 1981 is that while previously the economy was recorded as decreasing by more than 2 percent, it is now recorded to grow at 8 percent. A growth narrative informed by the evidence presented in the 1985/86 report would be considerably different than the one informed by the later 'revamped' series presented in the 1986/87 report.

4. Conclusion

Because of the limited space I have not been able to deal with the differences in baseline levels, nor present a comparative analysis of the national accounting methods. However, some findings can be reported. The source of evidence matter, and data quality differ. Not only does it matter whether one uses international databases or official evidence, the reported growth evidence does change depending on which report one uses. The element of statistical growth has been pointed out, and has shown to be potentially important for comparative growth studies.

Beyond those statistical implications, there are also some economic growth findings to report. Botswana is regarded as the African success story, the exception that confirms the rule. Its growth success is normally ascribed to the growth promoting polices, such as the role of private business and its openness to trade. It has also been the prominent example of the literature that has highlighted the importance of democratic rule and ethnic homogeneity. Those might all be correct observations on their own, but appears less causally important for aggregate growth. It might be that pricing of agricultural goods was favourable for the peasants and further that trade policies were favouring exports and that private entrepreneurs were given good conditions. Those policies seem less relevant in terms of economic growth. Economic growth was dependent on diamonds. Agricultural growth depended on the weather, and the rest of the economy grew in pace, and because of the mining sector. This careful view of the evidence suggests a revision of the Botswana success story.