Adjustments for GDP Exhaustiveness in Zimbabwe

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I.   Abstract

Examining the sources and methods used there has always been a high likelihood that the gross domestic product (GDP) in Zimbabwe is underestimated. Various types of evidence have also pointed in the same direction. Before independence in 1980, the main cause of under coverage was the exclusion of the subsistence sector from the data collection systems.

After 1980, a number of household based surveys which could be exploited to complement establishment based economic surveys to improve the exhaustiveness and accuracy of GDP estimates, was embarked upon. This opportunity was not exploited until in 1998 some estimates of the contribution of the informal sector were made using Income Consumption and Expenditure Survey (ICES) data. Evidence of underestimation however persisted.

In 2012 an exercise using a method based on comparing the numbers of employees in the formal sector by kind of economic activity from the 2004 Labour Force Survey (LFS) with those from the establishment based surveys for the same period and multiplying the difference by the gross value added per worker (GVAPW) for each kind of activity and then adding estimates for the informal sector was undertaken. A similar exercise has been undertaken using the 2011 LFS and 2011/12 ICES.

The 2012 exercise indicated that GDP could have been under estimated by up to 38% in Zimbabwe in 2004 with the Transport Storage and Communications sector being the most under estimated. The recent exercise using 2011 data indicates an underestimation of about 29% in 2011.

This paper looks at the underlying causes of the underestimation of GDP, the methods that have been used to measure and adjust for the underestimation, the implications of the errors in the data for development planning and the way forward in improving the economic statistical system in Zimbabwe.

II.   Summary

There has always been reason to believe that the sources and methods used for estimating the gross domestic product (GDP) in Zimbabwe could lead to underestimation. Various types of evidence have also pointed in the same direction. Before independence in 1980, the commercial sector was adequately covered by both administrative sources of data and censuses and surveys. The economic activities of the subsistence sector in which the majority of the population was engaged, where estimated, were done so using indirect methods and assumptions. For example crop production in the sector was estimated using deliveries to agricultural marketing authorities and assumptions about per capita consumption for retentions.

After 1980, under the auspices of the United Nations Household Capability Programme, a number of surveys were embarked upon to address the deficit of data for socio –economic planning which had become more inclusive. These household based surveys which included the annual Agriculture and Livestock Survey (ALS), the five yearly Labour Force Survey and the five yearly Income Consumption and Expenditure(ICES) could be exploited to complement establishment based economic surveys to improve the exhaustiveness and accuracy of GDP estimates. This opportunity was not exploited until in 1998 some estimates of the contribution of the informal sector were made using ICES data. Evidence of underestimation however persisted.

In 2012 an exercise was undertaken that could improve the exhaustiveness of the estimates not only by including the informal sector but by also correcting for the under coverage of the formal sector was undertaken using the results of the 2004 LFS.

The method used was based on comparing the numbers of employees in the formal sector by kind of economic activity from the LFS with those from the establishment based surveys. The differences indicated under coverage by the establishment based surveys. This difference was multiplied by the gross value added per worker (GVAPW) for each kind of activity to estimate the under estimation of value added in the formal sector for that kind of activity. The informal sector estimate was then added to come up with a more exhaustive estimate of GDP.

The results indicated an under estimation of up to 60% of GDP in Zimbabwe. Transport Storage and Communications, Community, Social and Personal Services, Finance, Real Estate and Business Services, mining and manufacturing, in that order, are the most underestimated kind of activity sectors.

It should be noted though that the data used for the exercise had some problems in that (i) the kind of activity classifications used for the different sources of data were not always coincident in detail, (ii) the GDP figures for 2004 were already being affected by the abnormally high non response rates and hyper inflation affecting the period 2004 to 2008. The exercise is thus being repeated using the 2011 Labour Force Survey results.

This paper looks at the underlying causes of the underestimation of GDP, its implications for development planning, the methods that have been used to measure and adjust for the underestimation, and the way forward in improving the economic statistics system.

III.   Introduction :Apriori Evidence of the Existence of Non-Exhaustiveness

The Eurostat tabular approach, which was recommended by the 2011 International Comparison Programme (ICP) to ensure exhaustiveness in the estimation of the gross domestic product (GDP), lists seven types of non-exhaustiveness, labeled N1 to N7. Under the category not registered, it includes (i) the underground economy or those who deliberately do not register to avoid certain obligations, N1, (ii) those involved in illegal activities, N2 and (iii) those not required to register on account of size or lack of market output, N3. Under the category not surveyed it lists two types of non-exhaustiveness, both of which involve the exclusion of registered producers from surveys because of inadequacies of the statistical business register, N4 and N5. The third category only includes misreporting in order to avoid tax and social security obligations, N6. The fourth and final category contains the seventh type of non-exhaustiveness which involves statistical deficiencies of data that are incomplete or cannot be directly collected from surveys or data that are incorrectly compiled during survey processing, N7.

No empirical evidence can be given as to the extent, each of the types of non-exhaustiveness, applies in Zimbabwe. However, a number of indicators point to a prevalence of most of the types. For example, since 2009, when regular economic surveys by the Zimbabwe National Statistics Agency (ZIMSTAT) resumed, response rates have been consistently below 50% by head count. Thus the Quarterly Employment Inquiry (QEI) has had the following average annual response rates from 2009 to 2012, respectively: 36%, 29%, 46% and 48%. The QEI covers all kinds of economic activity in terms of the International Standard Industrial Classification of all economic activities (ISIC). It should be noted that the response rate in terms of contribution to employment is not as poor as the head count response rate indicates. For example in 2012 it is estimated that of the 7724 establishments in the QEI register, including public service establishments (part of special returns), 1674 or 23.4% contributed 90% to total employment of the establishments. High non-response rates allow for N7 type of non-exhaustiveness. This is more the case when the period over which the estimation for non-response is long and spans pronounced economic changes.

 A number of establishments in ZIMSTAT's business register were reported as having relocated, when the surveys resumed, but it was not possible to establish where they had moved to. The Registrar of Companies' register, which is the main source of information for ZIMSTAT's business register, had not been updated since onset of the country's economic meltdown spanning the years 2005 to 2008. These deficiencies in the registers lead to N4 and N5 types of non-exhaustiveness. These lead to underestimation of the contribution of the formal sector to GDP.

Illegal economic activities such as gold panning and smuggling, prostitution, growing and selling of hemp and others that are within the production boundary of the System of National Accounts (1993 SNA and 2008 SNA), take place in Zimbabwe but are not covered by the sources of data used for compiling GDP. For example according to an article in one of the country's daily news papers, NewsDay of 13 December 2012, Transparency International Zimbabwe (TIZ) researchers estimate that illegal gold panners produce two tones of raw gold per month. "Of the total gold output, licensed dealers buy 3% of the gold, 10% is sold illegally across the borders and 87% is bought by private buyers who can also be illegal." The Zimbabwe Republic Police (ZRP) also sometimes mount special operations to get rid of illegal gold panning or of prostitution while there are many court cases of people arrested allegedly growing or selling or transporting hemp. These examples indicate that N2 type of non-exhaustiveness exists.

Traditionally, the Communal Lands, where the majority of the population resided mainly practicing subsistence farming, were scantily covered by any surveys or administrative records. The household sector in urban areas, particularly black African households, was similarly excluded. Notable exceptions were the population census, school enrolment, numbers of cattle collected through the dipping system, sales of crops and animals to agricultural marketing authorities and a 1978 budget survey for lower income urban families for deriving Consumer Price Index Survey (CPI) weights. Contribution to GDP estimates for the Communal Lands sector were based on the crop and animal sales and assumptions on per capita consumption for retentions. Some estimates were also made for own capital formation. The complacency may have partly been based on the reasoning that since most of the economic activity in the sector was non-monetary, it had little impact on the rest of the economy.

Starting from 1982 a programme of integrated household surveys was launched under the auspices of the United Nations Household Surveys Capability. The surveys in the programme included the annual Agriculture and Livestock Survey (ALS), at that time confined to the Communal Lands households as the rest of the agricultural sectors – the Large Scale Commercial Farms and the Small Scale Commercial Farms – were covered by annual censuses of production. The ALS was expanded to cover all agricultural production after the land reform programme, starting from 2003. The other components of the integrated surveys were Labour Force Survey (LFS), the Income, Consumption and Expenditure Survey (ICES) and the Inter-censal Demographic Survey (ICDS).

These rich new sources of data were not initially exploited to improve the exhaustiveness of GDP estimates. The exclusion of these household economic activities leads to N3 type of non – exhaustiveness.

In 1998 the revised national accounts estimates included estimates of the contribution of the informal sector, based on data from the 1995/96 ICES. The same percentage contributions of the informal sector were assumed to hold prior and after 1995. However indications that the GDP could still be underestimated persisted and increased after the economic meltdown referred to above. The

indications include the high ratio of tax revenue to GDP, the high levels of fuel consumption compared to other countries in the region with purportedly bigger economies as measured by GDP and supplies of certain intermediate inputs, such cement, which outstrip accounted for use.

In this paper an exercise to measure the possible magnitude of the undercount and its results are presented. The exercise is based on elements of the labour input method of adjustment for exhaustiveness.

IV. The Measurement of and Adjustment for Non-Exhaustiveness

A. The Data Used

The Zimbabwe National Statistics Agency (ZIMSTAT) conducts an Agriculture and Livestock Survey (ALS) every year to obtain data on outputs, intermediate consumption (and hence value added) and numbers employed, among other variables. It also conducts a Census of Industrial Production (CIP) on establishments involved in mining and quarrying, manufacturing, electricity and water supply and construction to derive value added and obtain numbers employed in those kinds of economic activities, among other data sets. National Accounts questionnaires (NAQs) are sent to registered establishments engaged in the production of all services except public administration and domestic services. A quarterly employment inquiry (QEI) is conducted on establishments in all kinds of economic activities except agriculture, public administration and domestic services. Numbers employed are obtained from the QEI. Value added for the services sector is derived from combining data from the NAQs and the QEI. In 2011 a labour force survey was conducted yielding figures on numbers employed in the formal, informal and household sectors, by kind of economic activity. A Poverty, Income, Consumption and Expenditure Survey (PICES) was also conducted from June 2011 to May 2012. This survey, for the purpose of this exercise, yielded numbers employed and value added in household unincorporated enterprises.

Data on public administration and government contribution to other services is obtained from government records.

The data for estimating the underestimation of the GDP in Zimbabwe in 2011 included (i) the GDP broken down according to the contribution of each kind of activity, i.e. its value added, (ii) the numbers of persons employed according to the kind of activity from (a) the QEI for both June and the annual average (b) the June 2011 LFS split among formal sector, informal sector and households and (iii) numbers employed and value added in household enterprises by kind of economic activity from the 2011/12 Poverty, Income, Consumption and Expenditure Survey (PICES).

B. Method of Estimation

The method uses the gross value added per worker (GVAPW) obtained by dividing the value added from the establishment based surveys by the

numbers employed from the QEI. This GVAPW to derive an adjusted value added for the formal sector by multiplying it by the numbers employed in the formal sector according to the Labour Force Survey (LFS). The formal sector GVAPW for mining and quarrying, manufacturing and construction are derived using CIP figures only. The GVAPW for the informal sector and households is obtained from the PICES. The value added of the informal sector and households is obtained by multiplying the PICES GVAPW by the corresponding LFS numbers employed.

The following formulae apply for the formal sector

1. GVAPW $=$ (VA from establishment survey)/(Numbers employed from QEI)

2. Adjusted VA $=$ (GVAPW) * (Numbers employed from LFS)

   For Informal Sector

3. GVAPW $=$ (VA from PICES)/(Numbers employed from PICES)

4. Adjusted VA $=$ (GVAPW) * (Numbers employed from LFS)

One set of exceptions for the formal sector are for mining and quarrying, manufacturing and construction for which:

5. GVAPW $=$ (VA from CIP)/(Numbers employed from CIP)

6. Adjusted VA $=$ (GVAPW) * (Numbers employed from LFS)

Another exception is with respect to transport and communication. For this kind of activity for the formal sector the estimates are given by:-

7. $GVAPW_1$ $=$ (VA from establishment surveys)/(Numbers employed from QEI)
8. VA_1 $=$ (GVAPW1)(numbers employed from QEI)

9. $GVAPW_2$ $=$ (GVAPW from PICES)

10. VA_2 $=$ $(GVAPW_2)$*(Numbers employed from LFS – Numbers employed from QEI)

11. VA $=$ $VA_1 + VA_2$

No adjustment is made for the formal sector for electricity and water supply as the industry consists almost entirely of government related enterprises.

The adjustment for transport and communication split the total figure of numbers employed in the formal sector according to the LFS (86) into two components. The first component (29) is equal to the QEI figure. The second component is the remainder (86 – 29 = 57). For the first component the establishment based GVAPW given in table 2 (USD 29 244) was used to derive VA. For the second component the informal sector GVAPW (USD 2 272) was used. This was done because the respondents to the establishment based surveys are dominated by the telecommunications sector whose GVAPW is much higher than that of small transport establishments (which, is assumed are not covered in the establishment based surveys and are only picked up in the household based LFS), whose GVAPW was estimated using the informal sector GVPWA, as a lower bound. This is likely to underestimate the undercounting of VA in this sector.

Tables 1 to 5 below show the calculations and the results

Table 1 presents the annual average numbers of employees in 2011 in column 2. Columns 3 to 5 of the table show formal sector, informal sector and the household sector numbers of employees obtained from the June 2011 Labour Force Survey, seasonally adjusted to be equivalent to annual averages using data from the QEI. Column 6 shows numbers employed by unincorporated household enterprises obtained from 2011/12 PICES.

Table 2 derives the gross value added per worker (GVAPW). It should be noted that the published GDP figures already include an estimate of the contribution of the informal sector based on the 2001 Income Consumption and Expenditure Survey (ICES).

This estimate has to be removed to remain with the formal sector value added only.

Table 3 presents the estimates of GVAPW obtained from the Census of Industrial Production data only. These ratios are deemed superior to those obtained in table 2 using QEI numbers employed in that both the numerator (value added) and denominator (numbers employed), are from the same source.

Table 4 shows the adjustment to GDP. It should be noted that no adjustment is made for Agriculture, Public administration and Domestic services. The ALS is comprehensive including all the labour force survey sectors, formal, informal and household as defined in the International Labour Office documents e.g. "Measuring the informal economy. From employment in the informal sector to informal employment" by Ralf Husmanns. Public administration is the business of government.

Table 5 finally compares the adjusted VA and GDP to the published VA and GDP.

Table 1: Numbers Employed (thousands)

Kind of Economic Activity	2011 QEI Ann'l Average	2011 Labour Force Survey (LFS)*			2011/12	Formal
		Formal	Informal	Households	PICES	Undercount
1	**2**	**3**	**4**	**5**	**6**	**7 = 3 - 2**
Agriculture, Forestry & Fishing	387	227	5	3,970	282	
Mining & Quarrying	42	86	20	2	17	44
Manufacturing	129	171	91	6	47	42
Electricity & Water	17	15	0	0	0	
Construction	20	42	58	3	26	22
Wholesale & retail trade	68	160	366	9	137	92
Transport & Communication	29	82	23	0	19	53
Finance & Insurance	66	25	1	0	1	
Public Administration	96	72	0	0	0	
Education	130	160	5	0	1	30
Health	48	48	3	17	2	0
Private Domestic	84	2	2	79	0	
Other	55	169	103	19	105	114
Total	**1,172**	**1,341**	**676**	**4,106**	**636**	**395**

Table 2: Derivation of gross value added per employee (GVAPW)

Kind of Economic Activity	2011 Pulished VA (USD'000)	Formal Ratio Ex 2001 ICES	2011Formal VA (USD'000)	Inf'l VA Ex PICES (USD'000)	GVAPW Formal USD	GVAPW Informal (USD)
1	8	9	10 = 8*9	11	12 = 10/4	13 =11/7
Agiculture, Hunting and Fishing and Forestry	1,222,053					
Mining and Quarrying	920,726	0.79	727,373	27,668	17,277	1,630
Manufacturing	1,409,087	0.8	1,127,270	128,641	8,752	2,737
Electricity and water	432,050	0.99	427,730	6,433		
Construction	70,615	0.83	58,611	105,176	2,916	4,077
Distribution, hotels, and Restaurants	749,729	0.76	569,794	312,231	8,355	2,286
Transport and communication	1,084,609	0.79	856,841	43,281	29,244	2,272
Finance, Insurance & Real Estate	671,289	0.84	565,869	4,924	8,574	4,804
Public administration	321,378	1	321,378	128	3,337	
Education	423,036	0.9	380,732	1,790	2,929	1,356
Health	134,461	0.98	131,772	(101)	2,740	-67
Domestic Services	39,125	1		0		
Other Services	391,462	1	391,462	141,045	7,066	1,350
Total	**7,869,621**	**11**	**5,558,832**	**771,216**		
Less Fin.Int Services Indirectly Measured	-50,254					
GDP at factor cost	**7,819,367**					
Net taxes on production	134,420					
Other taxes on production	134,420					
Other subsidies on production	0					
GDP at basic prices	**7,953,787**					
Net taxes on products	911,641					
Taxes on products	911,641					
Subsidies on products	0					
GDP at Market Prices	**8,865,428**					

Table 3: Formal sector derived from the 2011 Census of Industrial Production (CIP)

Kind of Economic Activity	CIP VA	Numbers Employed	GVAPW
	(USD'000)	('000)	(USD'000)
1	**14**	**15**	**16**
Mining and Quarrying	328,185	21,949	14,952
Manufacturing	1,240,418	130,978	9,470
Electricity and water			
Construction	51,336	7,382	6,954

Table 4: 2011 Adjusted value added (VA) (Thosands of US Dollars)

Kind of Economic Activity	GVAPW Used Formal	GVAPW USED Informal	Adjusted Value Added Formal	Informal	Household	Total
1	**17**	**18**	**19 = 3*17**	**20 = 4*18**	**21 = 5*18**	**22**
Agiculture, Hunting and Fishing and forestry						
Mining and Quarrying	14,952	1,630	1,284,378	32,320	3,605	1,320,304
Manufacturing	9,470	2,737	1,619,265	248,137	16,731	1,884,133
Electricity and water		0	427,730	6,433	0	434,162
Construction	6,954	4,077	289,770	236,677	12,710	539,157
Distribution, hotels, and Restaurants	8,355	2,286	1,340,712	835,941	19,937	2,196,590
Transport and communication	11,915	2,272	976,439	51,437	0	1,027,876
Finance, Insurance & Real Estate		4,804	565,869	3,213	0	569,082
Public administration		0	321,378	0	0	321,378
Education		1,356	380,732	7,205	0	387,937
Health		0	131,772	0	0	131,772
Domestic Services		0	0	0	0	0
Other Services	7,066	1,350	1,194,343	139,489	26,277	1,360,109
Total			**8,532,387**	**1,560,852**	**79,260**	**10,172,500**

Table 5: 2011 GDP Undercount

Kind of Economic Activity	Published GDP	Revised GDP	Difference	Difference As %age
22	**23**	**24**	**25**	**26**
Agiculture, Hunting and Fishing and forestry	1,222,053	1,222,053	0	0
Mining and Quarrying	920,726	1,320,304	399,578	30
Manufacturing	1,409,087	1,884,133	475,046	25
Electricity and water	432,050	434,162	2,112	0
Construction	70,615	539,157	468,542	87
Distribution, hotels, and Restaurants	749,729	2,196,590	1,446,861	66
Transport and communication	1,084,609	1,027,876	(56,733)	(6)
Finance, Insurance & Real Estate	671,289	569,082	(102,207)	(18)
Public administration	321,378	321,378	0	0
Education	423,036	387,937	(35,099)	(9)
Health	134,461	131,772	(2,689)	(2)
Domestic Services	39,125	39,125	0	0
Other Services	391,462	1,360,109	968,647	71
Total	**7,869,621**	**11,433,678**	**3,564,057**	**31**
Less Fin. Int Services Indirectly Measured	-50,254	-50,254	0	0
GDP at factor cost	**7,819,367**	**11,383,424**	**3,564,057**	**31**
Net taxes on production	134,420	134,420	0	0
Other taxes on production	134,420	134,420	0	0
Other subsidies on production	0	0	0	
GDP at basic prices	**7,953,787**	**11,517,844**	**3,564,057**	**31**
Net taxes on products	911,641	911,641	0	0
Taxes on products	911,641	911,641	0	0
Subsidies on products	0	0	0	
GDP at Market Prices	**8,865,428**	**12,429,485**	**3,564,057**	**29**

C. Results

The results show a possible underestimation of GDP by up to 29% in 2011. The most underestimated kind of activity is that of construction, 87% of the adjusted figure. This is followed by other services (71%), distribution, hotels and restaurants (66%), mining and quarrying (30%) and manufacturing (25%).

There is an overestimation of the finance, insurance and real estate sector by 18%. This could well be because there was much less trading in foreign currency in 2011 than there was in 2001 when the contribution of the informal sector in that industry was last estimated. Casual observation of the activities in the streets of the main and the reduction in the number of registered bureau de changes would confirm that. There is

also an overestimation (9%) in education for which possible explanations still have to be found. Transport and communication (6%) is probably overestimated due to the rapid increase in the share of the formal sector led by the mobile telephone sector compared to 2001.

V.   **Effects of Non-Exhaustiveness**
The effects of non-exhaustiveness of the GDP estimates in Zimbabwe are
the same as in any other country as often stated in the literature.   These include the fact that all targets denominated by the GDP may appear to be achieved when infact they are not. An example is the listing of Zimbabwe as having one of the highest revenue to GDP ratios in the world. This may lead the revenue authorities to start patting themselves on their backs before they reach the requisite standards of performance in their work, depriving the nation of direly needed government revenue.

Similarly assessments of welfare are distorted.   The size of the economy is incorrectly measured and hence its ranking among other countries is wrong. The comparisons of the economic performance of the country are not reliable.

In general the analysis of the economic conditions of the country and hence planning and management are put on an unsecured footing.

VI.   **The Way Forward**
As a way forward the soundness of basic economic statistics has to be improved.

In the first instance the register of enterprises and establishments has to be improved. In that direction two exercises so far supported by the USAID and DFID in addition to the Government of Zimbabwe (GoZ), are likely to yield improvements. These are the construction of a Central Business Register (CBR) and the carrying out of the Services Survey based on the CBR.

The push to improve the response rates based on the current registers which seems to be slowly bearing some fruits (as is evident in the figures for 2009 to 2012) mentioned above, needs to be increased.

The exercise described in this paper of comparing different data sources and making adjustments needs to be performed at a more detailed level.

Work on Supply and Use Tables (SUTs) needs to be resumed and the comparisons and adjustments made in that framework.

There is also work, mainly supported by the African Development Bank (AfDB), to improve the estimates of the components of expenditure on the GDP. This will yield strong independent estimates of the GDP, thus cross checking the production approach based estimates and improving work on the SUTs.

Resources for the work on national accounts need to be improved. For example there is only one person in the national accounts department, the head. He cannot perform all the required work alone.

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