Class Size: Effect on Achievement in East and Southern Africa

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Abstract

Class size has been an important issue in discussions and dialogue on quality of education as well as issues of financing education, especially teacher numbers and remuneration. As a result Class size has not only been one of the most researched topics in education but also a sensitive and almost politically emotional issue in many countries. In Africa, as many countries introduce and implement universal primary education, within contexts of scarce resources and hence low capacity to employ adequate teachers, class size is a major challenge for Ministries of Education and Finance. The quest of the optimal class remains a big challenge in balancing the pressure for improved quality which is believed to be linked with small class size and the fiscal constraints and conditionalities that prevail in countries with heavy donor support in financing education, especially primary education

Teachers, schools, parents prefer smaller classes because they are supposed to be easier to manage and offer better opportunity for teachers to pay individual attention to children, in the belief that children learn better in smaller classes and achieve higher.

However from previous studies, there has been no evidence that smaller classes perform better than larger classes. The studies have also indicated that different schools and even countries have different ways of organising their classes. Many of them place the poor performers in small classes and while small classes may have a significant effect on the achievement of disadvantaged children and poor performers this doesn't seem to apply to better performing students. SACMEQ data offers the opportunity to identify the possibility of relationships between class size and achievement in Mathematics. In analysing the SACMEQ data, there is also the opportunity to provide empirical evidence to policy and decision making on class size to policy makers as they struggle with issues of quality and efficiency of the education systems.

This paper looks at SACMEQ data archive from 14 African countries to see whether there is any relationship between class size and pupil achievement in reading and mathematics in Grade 6. It will show that there are very many variables that affect achievement, and the fact that pupils in small class size might achieve better than their counterparts in large class, such achievement can not be wholly attributed to class size. There may be need therefore to research further on class size in relationship to teaching practices. Policy makers may also need to pay more attention to improved teacher quality through better recruitment practices and training of teachers.

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Introduction

Class size has been an important issue in discussions and dialogue on quality of education as well as issues of financing education, especially teacher numbers and remuneration. As a result class size has not only been one of the most researched topics in education but also a sensitive and almost politically emotional issue in many countries. In Africa, as many countries introduce and implement universal primary education, within contexts of scarce resources and hence low capacity to employ adequate teachers, class size is a major challenge for Ministries of Education and Finance. For example, in countries like Kenya, Uganda, Tanzania and Malawi where the governments have recently introduced free primary education, there has been a tremendous growth in primary school enrolments and there has been great pressure on government to employ more teachers from the teachers' union. The quest of the optimal class remains a big challenge in balancing the pressure for improved quality which is believed to be linked with small class size and the fiscal constraints and conditionalities that prevail in countries with heavy donor support in financing education, especially primary education.

Schools, where they have the choice, prefer smaller classes because it is expected that smaller classes lead to better teaching and learning. In smaller classes pupils are easier to manage and they offer better opportunity for teachers to pay individual attention to children and the expected results are better achievement in examinations. Most teachers prefer smaller class sizes because it is easier to cope with fewer pupils as teachers tend to spend less time on discipline issues and classroom management. This provides teachers with greater flexibility, enabling them to use a variety of teaching methods. It is also perceived to be easier to socialise children when there are fewer of them in a class. Parents will put pressure on schools to organise classes with fewer students because fewer children can be given more individual attention. Some educators and politicians believe that smaller classes lead to higher achievement, while teachers' unions will campaign for recruitment of more teachers. For teachers

there is also the fact that fewer pupils in a class means less preparatory work, test and class exercises to mark.

This simple view that smaller classes will lead to higher achievement is offset by two major factors:

1. School heads organize the grouping of children into classes and often they put the backward children into the smallest classes (and sometimes even give them the best teachers) because they need most help. The large classes have the 'better' children in them and in these circumstances the correlation between class size and achievement is always positive indicating that pupils in larger classes achieve better. But, some other school heads will often put the best pupils into the smallest classes (and also give them the best teachers) because they want to be sure that the best pupils will achieve well. In this situation the correlation between class size and achievement is negative.
2. In teacher training (and re-training), the tricks of the trade that are taught assume classes of a certain size. Thus, in some countries an assumption is made that the class sizes will be about 25 and in other countries it is 35. In Japan nearly all classes have 42 pupils in them. Hence, the Japanese teachers are taught about methods and class organization with the assumption that there will be 42 pupils in the class. In South Korea in junior high school it used to be 65 in a class and the teacher training had this in mind. It was not by chance that the Ministry, through the then Korean Education Development Institute, developed a support system that included producing tests to be given to the pupils every two weeks, a system whereby teachers had to supervise the pupils marking each others' tests, using pupils to teach other pupils, having the teacher dispense extra tuition in small groups, and giving remedial exercises and enrichment exercises to others.
3. In some countries, especially where passing the examinations at the end of the primary cycle is the major criteria for selection to the next level and schools compete for ranking of the best student and/or school, class size grows smaller in the upper grades. The process involves weeding out children performing below the set minimum marks to proceed to the next level. Many children therefore have to repeat grades; some can repeat three times during their

primary schooling while others may give up and drop out or transfer to another school. In some cases, such as Kenya, repetition rates are as high as fifteen percent, even though the policy discourages repetition. The bright children are left to continue to the highest level of the primary cycle. The size of the class, in this case, although deemed the most important for good results for the school is not the major factor as schools use selective criteria of the brightest children to do the exams.

There has been much research into class size. Some has dealt with what teachers and parents believed the effect of class size was. Some has been to do with educational processes and class size. There is some evidence that in smaller classes, teachers devote more time to student support. One such study, that is widely quoted and been used for campaigns for reduced class size in America is the Tennessee's Student/Teacher Achievement Ratio, known as STAR (1985-1989).

The *STAR* experiment found that:

- Smaller class students substantially outperformed larger class students on both standardized (Stanford Achievement Tests) and curriculum-based tests (Basic Skills First). This was true for both white and minority students in smaller classes, and for smaller class students from inner city, urban, suburban, and rural schools.
- The positive achievement effect of smaller classes on minority students was double that for majority students initially, and then was about the same.
- A smaller proportion of students in the smaller classes was retained in-grade, and there was more early identification of students' special educational needs.
- There were no significant differences in academic achievement for students in the larger classes with or without an additional instructional aide.

But in an article published by American Education Research Association, 'Class Size Counting Students Can Count'

> **"The most dramatic impact seems to be achieved by reaching students early. Ideally students should experience small classes of 13 to 17 students when entering school or kindergarten or first grade."**

The article states that there is strong evidence that pupils will perform well academically during the first years in a small class but it is not very clear whether the fact that a child started in a small class adds value in higher classes. Another observation is that the class size, to have any observable effect on achievement, it would have to have fewer than twenty; about 15 pupils in a class.

According to Hanushek, the results of the study give evidence of effects at kindergarten and first grade but do not show the benefits in upper grades nor the effects that would be expected from reductions of a smaller magnitude than the one third reductions used in the study.

An analysis of the Third International Mathematics and Science Study (TIMSS) by Wöβmann and West (Wöβmann and West, 2002), indicated that there didn't seem to be a causal class size effect on performance in mathematics in Singapore as students in larger classes performed better than those in smaller classes. With an average class size of 33.2, was the best performing country in mathematics. In that study, Japan and Singapore the larger classes seemed to be performing better than students in smaller classes.

Smaller class size however, seemed to work better for Iceland and Greece, in the same study. The average class in Iceland was 20.3 and there was evidence that 'a class that is 5 students smaller than another would have performed, on average, slightly more than 10 test-score points better as a result of class size effect'.

Further analysis indicated that teachers in Japan were more qualified and better paid than teachers in Iceland and Greece, supporting the view that the quality of the teacher mattered, as better qualified and motivated teachers were able to promote learning in small as well as large classes. The case of Iceland and Greece then indicated that less capable teachers can do better with smaller classes. The other factor was the fact that in Singapore, weaker students seemed to be consistently put smaller classes, leading to a situation where the better performing students are more likely to be found in larger classes.

According to Wöβmann and West, the question of whether there are sizable class size effects in educational production is one to be answered separately for each school system. And therefore the importance of assessing the impact of class size resources independently for different school system cannot be ignored.

There doesn't seem to be any convincing evidence that smaller class sizes are associated with increased achievement even as there is so much public demand for smaller classes for better performance by pupils. Was it different in some African states? The SACMEQ data offers the opportunity to identify the possibility of relationships between class size and achievement in Reading and Mathematics. This is important, especially in a region where some countries have to deal with the issue of pressure to reduce class sizes to achieve quality education within a context of fiscal constraints and inadequate number of qualified teachers. In analysing the SACMEQ data, there is the opportunity to provide empirical evidence to policy and decision making on class size to policy makers as they struggle with issues of quality and efficiency of the education systems.

The SACMEQ Data

In 1995, a consortium of national education ministries created the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ), aided by financial support from several governments. The consortium includes 15 countries: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zanzibar, and Zimbabwe. The International Institute for Educational Planning (IIEP), an agency of UNESCO, joined the consortium. SACMEQ has two main objectives: 1) to build the capacity of Ministries of Education to monitor and evaluate the quality of their education systems and 2) to provide information that will allow senior decision makers to make informed decisions about policies related to the quality of education. SACMEQ undertakes periodic data collection in member countries, which simultaneously provide training opportunities for educational researchers and also generates important indicators of the quality of education. The second study that SACMEQ conducted occurred in 2000, and all SACMEQ member countries participated – except for Zimbabwe (Ross et al., 2004). The authors of this article have used the data archive made available in October, 2004 (Ross et al., October 2004).

Target population and sampling: The target population for SACMEQ II was Grade 6 students enrolled in mainstream government and non-government schools. SACMEQ selected this grade level because: a) participation rates would be relatively high and non-selective (in some countries many students leave school between the primary and secondary levels), b) testing at lower grade levels was problematic because of a mixture of languages in the classroom in some countries up to Grade 3 level. National sampling frames were constructed using data from the Planning Division of the each Ministry of Education. Schools were then sampled with probability proportional to size (PPS). The numbers of sampled schools within countries was determined based on cluster sampling procedures and statistical power considerations (Ross, 1985). Although school sample sizes varied somewhat between countries, the range in most SACMEQ-II countries was between 140 and 185 schools. In Namibia, strong clustering required a larger sample: 270 schools. As the Seychelles population was small, the entire population of 24 schools was included. Within each sampled school, fixed-sized clusters of 20 Grade 6 students were randomly drawn from across grade 6 classes.

Response rates were extremely high for both students and schools, ranging between 91 and 100 percent for schools and 77 and 96 percent for students (Table 2.7a in Ross et al., 2004). Total sample sizes for the entire SACMEQ II study include 41,686 students in 2,305 schools, with overall response rates of 97 percent of students and 98 percent of schools. These very impressive response rates were achieved without replacing either schools or students. A complete description of the SACMEQ design and procedures has been presented in Ross et al. (2004). In Table 1 the SACMEQ II school and student sample sizes in each country have been presented.

Table 1: Sample sizes in SACMEQ II countries

Country	N. schools	N. Pupils	Country	N. schools	N. Pupils
Botswana	170	3322	Seychelles	24	1484
Kenya	185	3299	South Africa	169	3163
Lesotho	177	3155	Swaziland	168	3139
Malawi	140	2333	Tanzania	181	2854
Mauritius	153	2945	Uganda	163	2642
Mozambique	176	3177	Zambia	173	2611
Namibia	270	5048	Zanzibar	145	2514

Achievement Measures: The dependent variables were measures of achievement in reading and mathematics. An analysis of the major textbooks and curricula was undertaken and two test blueprints constructed. Test items using multiple-choice format were written with some being taken from other studies. The trialling of items was conducted for the first and second SACMEQ studies. Final tests were constructed such that there were continuous and normally distributed measures of reading literacy and mathematics achievement. No rotated tests were used so that each pupil attempted all items. Each pupil was tested in the eighth month of his or her sixth-grade year. Test scores, equated with Item Response Theory (IRT) methods, were standardized across SACMEQ countries to a mean [M] 500 and a standard deviation [SD] 100. Pupils were tested in the language of instruction. In 11 countries, testing was in English; Mozambique pupils were tested in Portuguese; in Tanzania and Zanzibar testing was in Swahili.

Method

Class groups are formed by school heads in many different ways. Take the case of pupils having difficulty being put into the smallest group because they needed most attention, but they still had lower marks than the other classes. This would yield a positive correlation between class size and achievement because the larger groups score better but this was only because the remedial children were in the smaller classes. But in other school systems the heads put the high-flyers into a small group and give them the best teacher because the head wants the good ones to be sure of getting a place in the best secondary schools. This would then typically result in a negative correlation – smaller classes do well. In order to get rid of the effect of brighter/poorer kids having been allocated to different class sizes it is often a good idea to partial out the effect of socio-economic status and then look at the relationship between class size and achievement.

Furthermore there are other factors that can affect class size. One major factor is rural-urban differences. It is common for the urban classes to be overcrowded and for the rural classes to be small.

In the SACMEQ sampling the sample within each school was 20 pupils drawn at random across all classes in Grade 6. This meant that in large schools with many classes there might only be a few pupils per class and therefore the stability of the estimates in such cases might not be so good. But, on the other hand, most schools had only two or three classes so that the class estimates of achievement were probably OK. All classes with fewer than four pupils were dropped form the analysis.

The key variables were Xclassiz - the class size for reading, and Yclassiz - the class size for math. These variables were derived from Q1 on the teacher questionnaire. The frequencies for these two variables were about the same simply because most countries had class rather than subject teachers.

The two achievement scores were Zralocp – the pupil raw reading score, and
Zmalocp - the pupil raw math score. These two variables each had a mean of 500 and standard deviation of 100. The reading test had 83 items and the math test had 63 items. This also means that 5 points on the reading test was worth about one item on the test. It could be argued that for a difference to be educationally meaningful it should be at least worth three items or 15 points. Probably this should be at least the same for the math test.

Two variables were derived: Resread – the residual reading score after having taken home background into account and Resmath - the residual math score after having taken home background into account. These were the residual scores after having removed the effect of home background using ordinary linear regression. In order to avoid aggregation bias, this was done at the pupil level and then the residual scores aggregated to the class level.

But, what was the home background? A principal component was constructed consisting of three variables:

a) Pupil total possessions: this was the sum of items of possessions in the home. The possessions were daily newspaper, weekly or monthly magazine, radio, TV set, video cassette recorder (VCR), cassette player, telephone, car, motorcycle, bicycle, piped water, electricity (mains, generator, solar), and a table to write on.

b) Quality of home: this was a composite consisting of type of lighting, as well as the structure of the floor, walls and roofs. Each variable (i.e. lighting, floor, walls and roof) was measured on a 4-point scale and combined to give a maximum score of 16.

c) Parental education: this was the average of the fathers and mothers education.

The home background had the loadings presented in Table 2 for the different countries.

Table 2: Loadings for Home Background principal component by country

Country	Possessions	Quality of home	Parental education
Botswana	.857	.848	.821
Kenya	.804	.830	.745
Lesotho	.745	.716	.773
Malawi	.820	.851	.832
Mauritius	.784	.647	.716
Mozambique	.822	.811	.766
Namibia	.871	.820	.765
Seychelles	.778	.504	.728
South Africa	.838	.819	.807
Swaziland	.826	.821	.806
Tanzania	.730	.814	.794
Uganda	.693	.788	.747
Zambia	.815	.841	.739
Zanzibar	.804	.817	.751

It can be seen that the weightings were more or less the same but that for example, in Seychelles and Mauritius, quality of housing was not so important as the other two variables.

Finally the variable Zsloc for school location (rural/urban) was used. From the school questionnaire, isolated and rural formed *rural* and small town and large town/city formed *urban*.

Results

How large or small were the classes?

The minimum and maximum sizes of class and the average class size in each country have been presented in Table 3.

Table 3: Minimum, maximum and average class sizes in each country

Country	Minimum	Maximum	Mean
Botswana	16	41	30.0
Kenya	10	68	36.9
Lesotho	5	97	44.9
Malawi	13	97	56.6
Mauritius	12	54	36.4
Mozambique	13	97	52.5
Namibia	10	81	38.3
Seychelles	12	36	27.4
South Africa	4	82	42.0
Swaziland	6	65	37.1
Tanzania	11	94	41.8
Uganda	20	50	38.0
Zambia	4	90	36.5
Zanzibar	22	84	49.8

In order to compare the class sizes internationally, the international quartiles (pooled data set) for class size (pretty well identical for reading and math) were produced and the percentage of pupils in each country in each international quartile calculated (see Table 4).

It can be seen that the countries with relatively high percentages of pupils in classes of 49 or more were Malawi, Mozambique and Zanzibar. On the other hand, Botswana, Mauritius and Seychelles were well-off in terms of class size with nearly all pupils in Botswana being in classes of fewer than 40, Mauritius fewer than 49 and Seychelles fewer than 39 with the majority being in classes of fewer than 30 pupils. The larger percentages of pupils in large classes tended to be in rural areas rather than urban areas in Malawi, Namibia, and South Africa whereas the opposite was true in Mozambique and Zambia.

Do smaller class sizes result in improved cognitive achievement?

As already stated most teachers prefer smaller class sizes because it is easier to cope with fewer pupils. It is claimed that it is easier to socialise the children when there are fewer of them in a class. Some teachers and some educators believe that smaller classes are always associated with improved achievement. But, the evidence on class

size and cognitive achievement has not favoured smaller classes (see Hanushek, 1998, and Finn & Voekl, 1995, for reviews of the research). The general results from previous studies have been that in a few cases achievement was higher in small classes and in some cases higher in larger classes but that for most class size differences there was no difference in achievement. In most cases there was no difference in achievement between 20 and 40 pupils in a class and in some cases between 20 and 55 pupils. If class size dropped below 15 pupils and if this was accompanied by teachers individualising the instruction then there was an increase in achievement. Was it different in some African states?

Table 4: Percentage of pupils in each country in classes of the size in the international quartiles by urban rural

Location	Int. quartile	Botswana %pupils	Kenya %pupils	Lesotho %pupils	Malawi %pupils	Mauritius %pupils	Mozambique %pupils	Namibia %pupils	Seychelles %pupils	S. Africa %pupils	Swazi %pupils	Tanzania %pupils	Uganda %pupils	Zambia %pupils	Zanzibar %pupils	ALL %pupils
Rural	30 or less	32.5	21.1	21.7	12.2	13.9	1.1	13.2	9.2	4.5	17.5	19.3	15.2	26.4	4.1	15.2
	31-39	16.0	19.6	9.5	13.7	18.8	3.4	20.3	6.9	12.3	31.9	21.3	31.7	10.4	11.3	16.3
	40-48	0.6	15.5	13.5	10.7	14.9	6.4	15.8		8.2	13.1	20.5	18.5	9.3	20.7	12.0
	49-98		11.2	20.2	30.4	0.7	14.6	14.3		18.7	8.0	10.3	14.3	1.9	22.7	12.0
	Total	49.1	67.3	64.9	67.0	48.3	25.5	63.5	16.1	43.8	70.5	71.4	79.7	47.9	58.9	55.4
Urban	30 or less	22.0	9.3	1.2	1.6	9.7	2.2	8.6	57.4	10.7	5.1	2.4	3.6	9.0	0.4	10.3
	31-39	27.9	7.0	3.8	0.2	17.2	5.0	18.7	26.5	14.5	10.0	1.4	6.5	12.5	4.0	11.1
	40-48	1.0	11.9	14.0	3.5	20.7	12.1	7.6		22.8	8.9	14.9	6.8	18.1	7.1	10.7
	49-98		4.5	16.1	27.7	4.1	55.2	1.5		8.2	5.4	9.8	3.4	12.4	29.6	12.5
	Total	50.9	32.7	35.1	33.0	51.7	74.5	36.5	83.9	56.2	29.5	28.6	20.3	52.1	41.1	44.6

Total	30 or less	54.5	30.3	22.9	13.8	23.6	3.3	21.8	66.6	15.2	22.7	21.7	18.8	35.4	4.5	25.4
	31-39	43.9	26.6	13.3	13.9	36.0	8.4	39.0	33.4	26.8	41.9	22.7	38.1	22.9	15.3	27.4
	40-48	1.6	27.4	27.6	14.2	35.6	18.5	23.4		31.0	22.1	35.5	25.3	27.4	27.9	22.7
	49-98		15.7	36.3	58.0	4.8	69.8	15.8		27.0	13.4	20.1	17.8	14.3	52.4	24.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In Table 5 the results have been presented by rural and urban areas separately by international quartile for the average class size, and the reading and math results. In the first country, Botswana, it can be seen that in the international quartile of less than 30 pupils in a class in rural areas the average for Botswana was 25.9 whereas in urban areas it was 26.9. In the third international quartile (40-48) it was 40 in rural areas and 40 in urban areas. The average class size in rural areas was 28.6 and in urban areas it was 31.3. In reading (the reading raw score) the achievement average score rose from smaller class sizes to larger class sizes. The same was true of the math scores.

In Kenya, the average class size was 36.6 in rural areas and 37.7 in urban areas. In Kenya, reading and math scores were highest for the smallest classes in both rural and urban areas. But, pupils in classes of 40-48 scored higher than pupils in classes of 31-39. Pupils in classes of over 49 scored lowest. In Lesotho, 41 percent of pupils were in schools in rural areas and three-fifths of these were in classes of over 49. There was no pattern of higher achievement for smaller classes.

The reader may peruse the rest of the countries and the matter of pattern of results will be returned to later. The graphs for the relationship between class size and reading and math achievement have been presented in the appendix.

Table 5. Class size and reading and math scores by international quartile by country

R/U	Internat. Quartile	Botswana Classsize	Botswana Readscore	Botswana Mathscore	Kenya Classsize	Kenya Readscore	Kenya Mathscore	Lesotho Classsize	Lesotho Readscore	Lesotho Mathscore	Malawi Classsize	Malawi Readscore	Malawi Mathscore
Rural	Less than 30	25.90	501.15	499.93	24.38	553.36	574.58	21.99	437.11	439.64	21.46	413.74	426.36
	31-39	33.75	503.96	501.21	35.08	520.81	539.89	34.41	438.21	430.35	34.96	426.11	421.36
	40-48	40.00	529.45	508.60	44.12	525.98	553.05	44.09	453.99	438.95	44.12	421.59	435.69
	49-98				51.97	512.65	532.22	60.89	438.81	435.39	68.81	426.93	431.43
	Total	28.63	502.43	500.46	36.62	530.83	552.50	40.52	441.32	436.82	49.32	423.51	429.13
Urban	Less than 30	26.94	536.45	527.19	23.74	575.14	583.12	27.55	482.07	482.87	24.07	410.06	435.43
	31-39	34.45	540.11	521.92	34.01	593.90	601.17	34.92	493.74	482.61	37.80	470.57	473.86
	40-48	40.18	568.70	554.20	43.51	573.65	580.71	44.30	457.88	450.23	45.70	415.01	413.99
	49-98				56.93	576.91	575.55	66.79	473.05	475.30	77.71	444.62	444.20
	Total	31.32	539.10	524.84	37.69	578.88	585.10	53.01	469.55	466.30	71.41	439.90	440.68

R/U	Internat. Quartile	Mauritius Classsize	Mauritius Readscore	Mauritius Mathscore	Mozam Classsize	Mozam Readscore	Mozam Mathscore	Namibia Classsize	Namibia Readscore	Namibia Mathscore	Seych Classsize	Seych Readscore	Seych Mathscore
Rural	Less than 30	24.43	495.29	540.44	26.67	499.29	519.81	26.20	420.31	410.39	24.63	544.82	528.07
	31-39	35.69	545.28	582.62	35.99	495.97	514.82	34.56	417.24	402.81	35.36	617.82	577.35
	40-48	42.80	546.03	605.93	44.42	501.28	517.54	43.48	418.74	403.93			
	49-98	49.00	557.32	570.07	56.57	504.38	529.23	57.91	414.37	402.88			
	Total	34.84	531.31	577.57	49.47	502.26	523.98	40.30	417.60	404.69	29.23	576.11	549.20
Urban	Less than 30	25.95	476.18	521.56	27.23	529.59	535.31	25.60	544.02	524.29	23.94	562.09	540.48
	31-39	35.78	503.66	547.42	35.03	527.38	534.10	34.87	511.46	482.27	33.79	628.72	587.52
	40-48	42.92	586.45	640.39	45.16	521.60	533.43	42.85	443.14	415.51			
	49-98	50.23	622.46	686.38	58.32	519.67	530.91	50.34	467.91	440.61			
	Total	37.95	541.13	591.30	53.69	520.80	531.67	35.00	503.01	476.46	27.05	583.14	555.32

R/U	Internat. Quartile	S. Africa Classsize	S. Africa Readscore	S. Africa Mathscore	Swazi Classsize	Swazi Readscore	Swazi Mathscore	Tanzania Classsize	Tanzania Readscore	Tanzania Mathscore	Uganda Classsize	Uganda Readscore	Uganda Mathscore
Rural	Less than 30	25.71	407.64	430.17	25.15	514.87	507.95	24.84	514.56	504.37	26.21	468.36	496.36
	31-39	34.95	421.49	428.19	35.31	521.94	517.88	34.64	539.48	520.38	35.07	482.88	520.79
	40-48	43.26	430.10	438.28	42.96	519.82	508.29	43.86	533.54	510.18	43.33	459.75	462.33
	49-98	58.58	432.99	442.89	51.95	504.00	494.13	58.16	498.11	489.67	49.60	484.26	498.04
	Total	45.66	426.59	436.57	36.08	517.76	510.95	38.02	525.07	508.69	37.92	474.99	498.46
Urban	Less than 30	27.52	591.86	564.80	26.49	564.77	552.02	25.17	592.84	535.87	26.48	459.61	498.07
	31-39	35.49	558.58	544.58	35.90	552.74	522.39	35.38	591.45	571.91	33.78	543.03	605.94
	40-48	43.33	545.49	517.82	43.36	553.07	515.59	44.90	593.94	551.14	43.30	512.09	512.08
	49-98	55.35	460.86	457.43	53.51	568.74	546.45	70.44	606.13	568.18	49.81	505.00	497.87
	Total	40.06	545.30	524.75	39.76	557.87	529.91	51.54	597.91	556.74	38.38	511.38	537.01

R/U	Internat. Quartile	Zambia Classsize	Zambia Readscore	Zambia Mathscore	Zanzibar Classsize	Zanzibar Readscore	Zanzibar Mathscore
Rural	Less than 30	22.40	411.81	418.51	27.75	467.86	475.54
	31-39	34.93	411.33	417.21	36.13	460.96	469.07
	40-48	43.00	407.54	416.54	44.05	465.08	469.42
	49-98	66.66	404.02	430.01	57.82	475.08	488.93
	Total	30.86	410.57	418.30	46.71	468.34	477.34
Urban	Less than 30	25.69	446.15	443.31	27.00	444.48	430.16
	31-39	35.58	462.93	442.46	36.20	481.78	488.55
	40-48	44.33	484.39	462.75	45.36	486.53	470.91
	49-98	55.87	463.15	445.12	59.23	495.67	480.61
	Total	41.76	467.55	450.34	54.31	492.28	479.25

Relationships between class size and achievement

In Table 6, the correlations between class size and achievement (both raw and adjusted) have been presented. Anything over 0.10 and negative (smaller classes associated with higher scores) is of interest.

Table 6. Correlations between class size and achievement

Country	Read raw	Read adjusted	Math raw	Math adjusted	Country	Read raw	Read adjusted	Math raw	Math adjusted
Botswana	.031	-.038	-.019	-.071	Seychelles	.443	.453	.387	.398
Kenya	-.091	-.126	-.102	-.128	S. Africa	-.202	-.171	-.205	-.159
Lesotho	.108	.077	.141	.126	Swazi	.035	-.002	-.008	-.028
Malawi	.149	.051	.113	.050	Tanzania	.147	-.001	.107	-.009
Mauritius	.316	.241	.317	.249	Uganda	.010	.010	-.094	-.095
Mozam	-.010	-.042	-.028	-.039	Zambia	.152	.084	.098	.051
Namibia	-.209	-.072	-.220	-.101	Zanzibar	.117	.084	.109	.098

In only three countries as a whole was it the case that smaller class sizes were associated with higher scores. The countries were Kenya, Mozambique and South Africa and they have been marked in red.

The same analysis was undertaken for urban and rural schools in each country and the results have been reproduced as Table 7. In all there were 112 correlations. Only twelve were significantly negative while 22 were significantly positive and 78 were neither positive nor negative. The significant positive correlations have been marked in blue and the significant negative ones in red.

Table 7. Correlations between class size and achievement in different countries by urban rural

Country	Read raw	Read residual	Math raw	Math residual	Country	Read raw	Read residual	Math raw	Math residual
Botswana					*Seych*				
Rural	.00	-.059	-.034	-.074	Rural	.348	.373	.265	.288
Urban	-.049	-.057	-.088	-.095	Urban	.468	.473	.417	.424
Kenya					*S. Africa*				
Rural	-.160	-.164	-.151	-.156	Rural	.087	.011	.096	.027
Urban	-.076	-.079	-.047	-.090	urban	-.315	-.253	-.300	-.247
Lesotho					*Swazi*				
Rural	.046	.013	-.025	-.040	Rural	-.041	-.020	-.048	-.037
Urban	.014	.013	.231	.239	Urban	-.024	-.036	-.004	-.039
Malawi					*Tanzania*				
Rural	.097	.053	.086	.061	Rural	-.042	-.080	-.048	-.077
Urban	.087	.024	.065	.020	Urban	.068	-.038	.091	.021
Mauritius					*Uganda*				
Rural	.205	.113	.224	.138	Rural	.009	.011	-.078	-.076
Urban	.412	.363	.393	.350	Urban	.000	-.002	-.168	-.181
Mozam					*Zambia*				
Rural	.083	.053	.079	.068	Rural	-.015	-.042	.024	.011
Urban	-.069	-.090	-.062	-.069	Urban	.031	.067	-.014	.008

Namibia					*Zanzibar*				
Rural	.008	.081	-.023	.035	Rural	.105	.117	.156	.159
urban	-.330	-.223	-.382	-.293	Urban	.010	.020	.029	.032

In all cases the correlations of class size with the adjusted scores (after having taken home background into account) were smaller than those with the raw scores. It is the correlations with the adjusted scores that are important because this is after the effect of whether the school head allocates dull or bright children to smaller classes.

Discussion

The high number of cases where there was no significant correlation between class size and achievement was noteworthy. The overall results were the same as in previous research. In international studies Asian students who are in general in larger classes (e.g., over 40) tend to achieve best. Blatchford and Catchpole (2003) who reviewed many studies of class size and student achievement claimed that where classes were smaller than 20 students they had higher achievement. Others claimed that this was only so when teachers individualised their instruction but that, in practice, this was rare. In the Programme for International Student Achievement (PISA) the authors distinguished between the Nordic countries, the East-Asian countries, and the Latin American countries. The Nordic countries had an average class size of 22 students, the East Asian 38 students and the Latin American countries 35 students. Their conclusion was:

'It is interesting to note that in all country groups, including the Nordic countries, the average class size lies within a range where adding additional students does not lead to discernible negative effects. Irrespective of average class size, in most participating countries, only a relatively small share of classes falls into the range where student numbers appear to adversely affect learning'.

Hanushek (1998) summarised his review with the words:

'While calls to reduce class size in school have considerable popular appeal, the related discussion of the scientific evidence has been limited and highly selective. The evidence about improvements in student achievement that can be attributed to smaller classes turns out to be meager and unconvincing. In the aggregate, pupil-teacher ratios have fallen dramatically for decades, but student performance has not improved. Explanations for these aggregate trends, including more poorly prepared students and the influence of special education, are insufficient to rationalize the overall patterns. International comparisons fail to show any significant improvements from having smaller pupil-teacher ratios. Detailed econometric evidence about the determinants of student performance confirms the general lack of any achievement results from smaller classes.

Finally, widely cited experimental evidence actually offers little support for general reductions in class size. In sum, while policies to reduce class size may enjoy popular political appeal, such policies are very expensive and, according to the evidence, quite ineffective'.

It is clear that the evidence from the fourteen African countries does not change the overall picture of research evidence about the effect of class size on educational achievement.

Evidence from various studies carried out on class size tend to indicate that reducing class size, although high on the agenda of education policy makers, on its own cannot, cannot improve learning. There are other factors with regard to the quality and level of resources that may influence student performance, and class size is just one of them. Perhaps there may be need to carry out further research, linking reduction of class size and classroom instruction to find out whether reduction of class size automatically changes the teaching practices. This is important, especially as teaching practices are most likely, especially within the African context, to be driven by a prescribed, centrally developed, curriculum and national examinations. Improvements on classroom instruction would focus on improved teacher quality as the teacher plays a very important role in the teaching/learning process. This may require greater attention not only on training of teachers but also on recruitment of teachers with better academic qualifications thus attracting higher quality teachers to the teaching force. Policy makers may need to focus on further improvement of teacher quality and classroom processes as concern is raised with regard to class size, little or no attention is paid to the higher teacher qualifications and little improvement of student performance.

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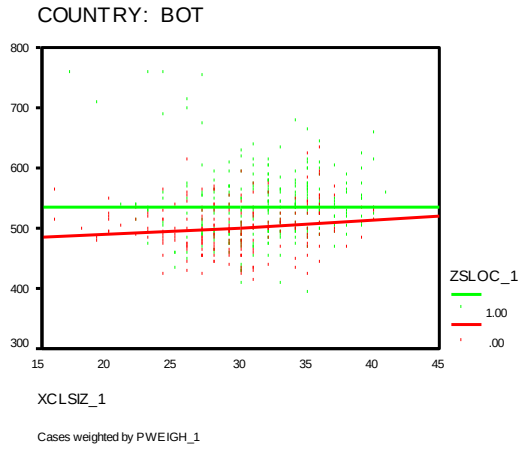
Appendix

The first graphs are for reading. First there is the raw score relationship and then the adjusted score relationship. The green line is for classes in urban areas and the red line for classes in rural areas. The graphs for reading have been followed by the graphs for mathematics.

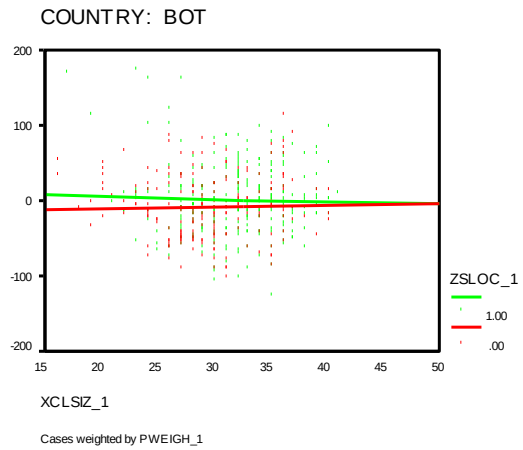
Reading

Botswana

Raw score

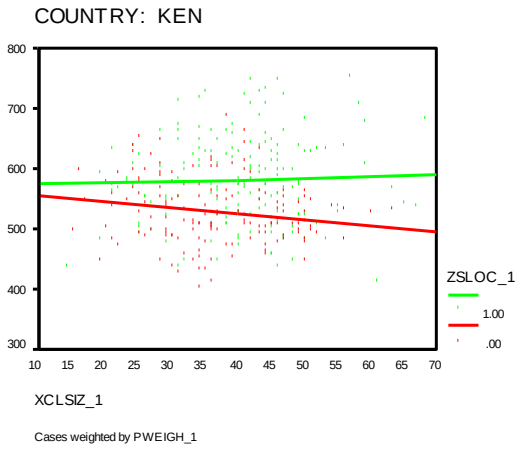


Adjusted score



Kenya

Raw score



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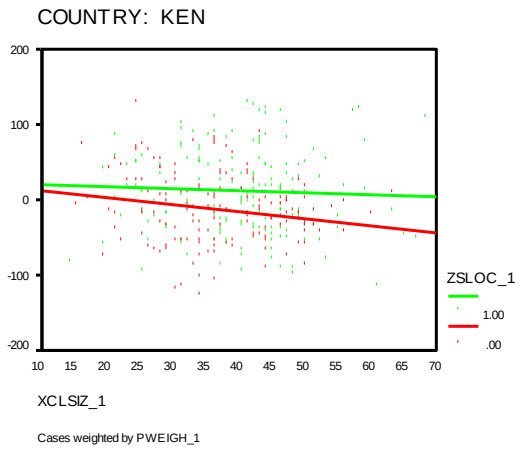
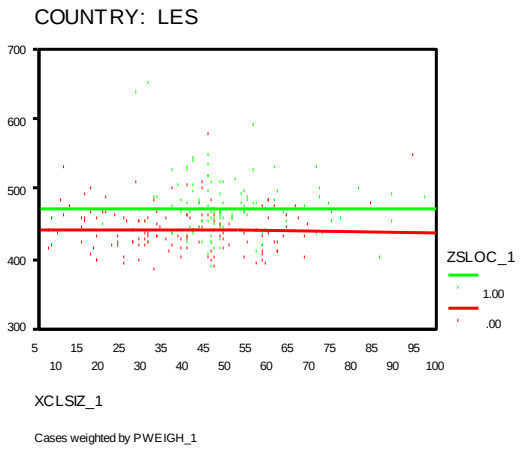
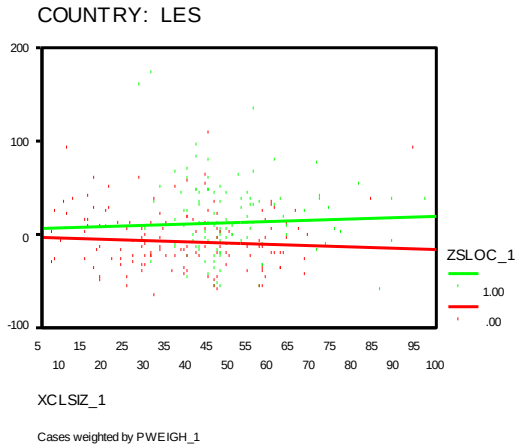


Lesotho

Raw score

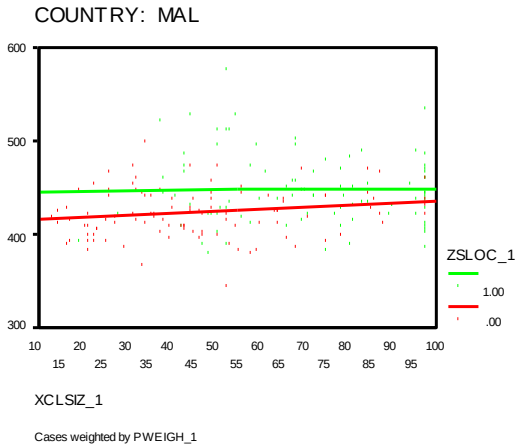


Adjusted score



Malawi

Raw score



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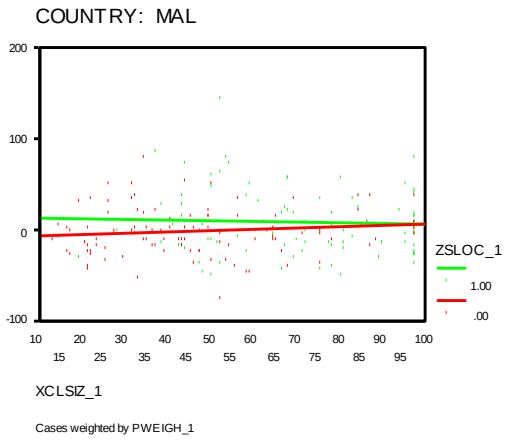
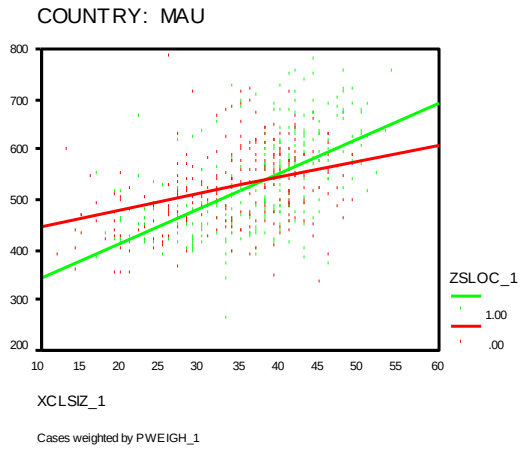


Mauritius

Raw score



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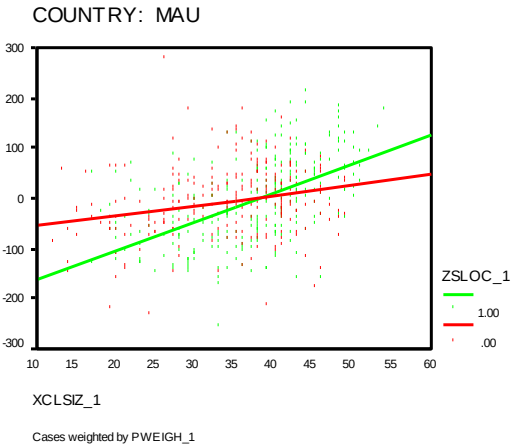
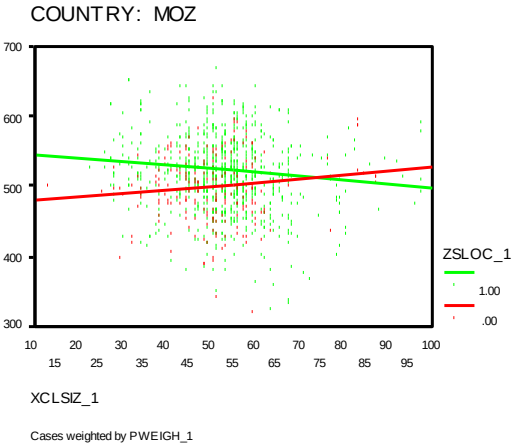


Mozambique

Raw score



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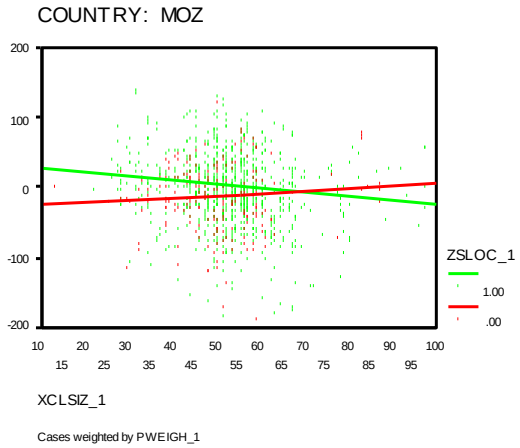
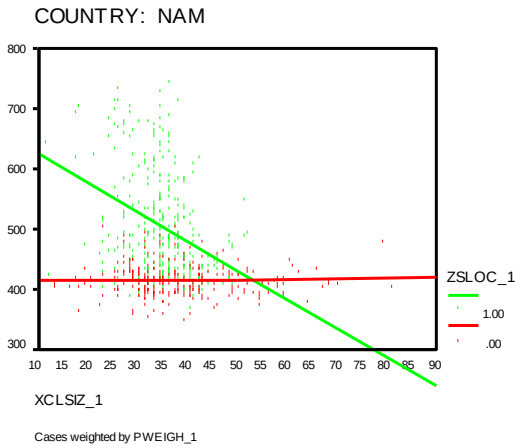
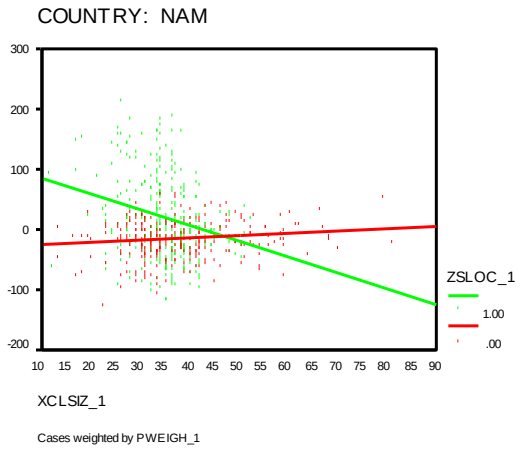


Namibia

Raw score

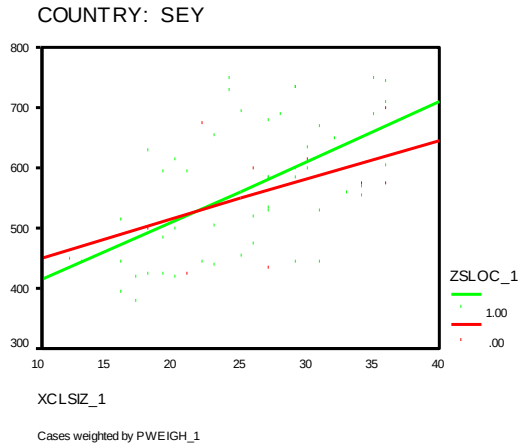


Adjusted



Seychelles

Raw score



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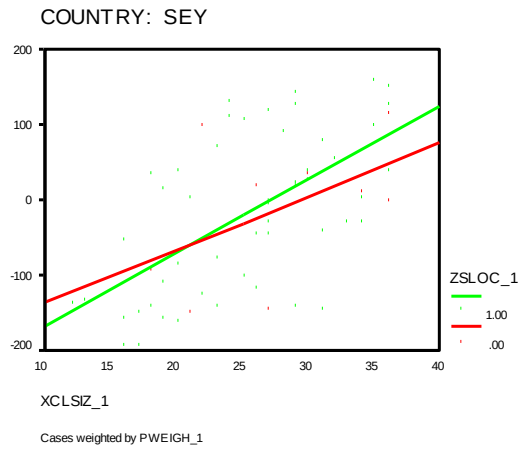
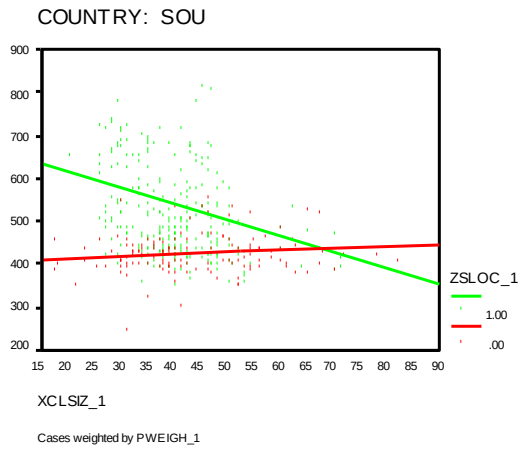


South Africa

Raw score



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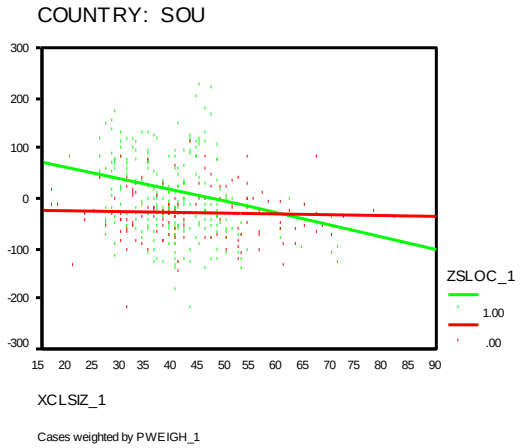
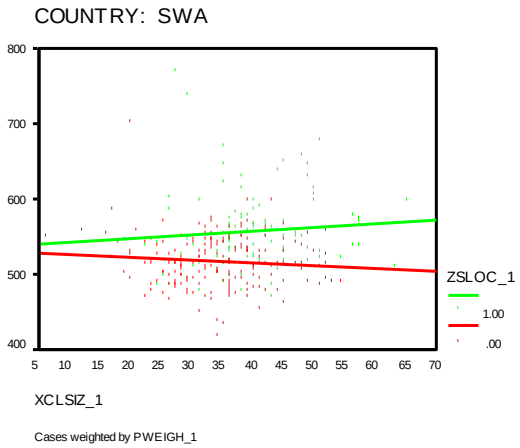


Swaziland

Raw score



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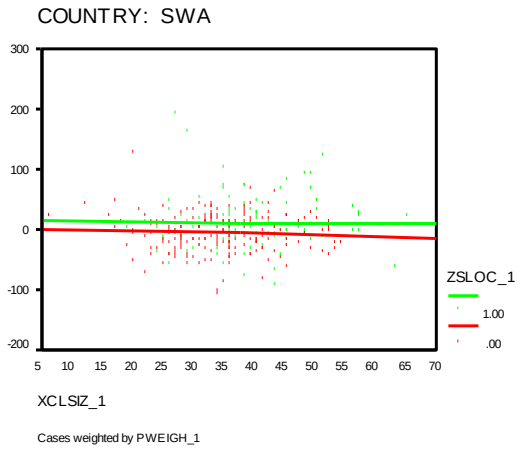
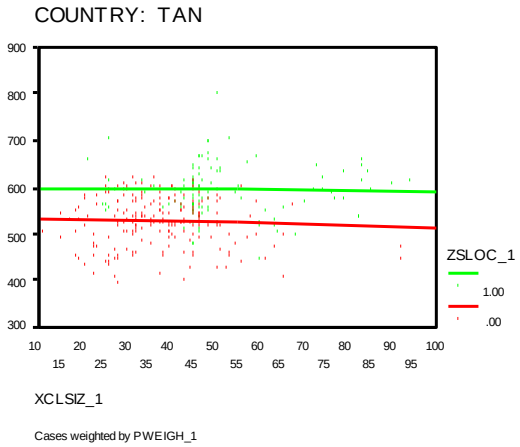


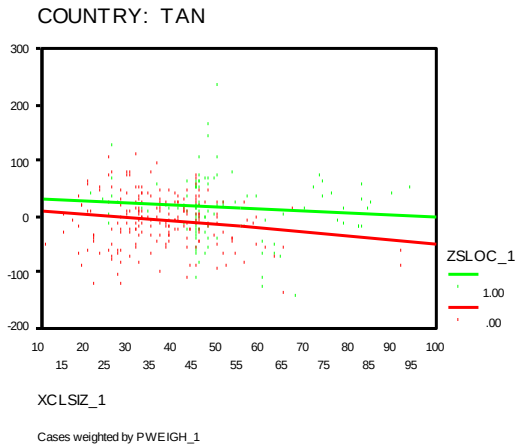
Tanzania

Raw score



Cases weighted by PWEIGH_1

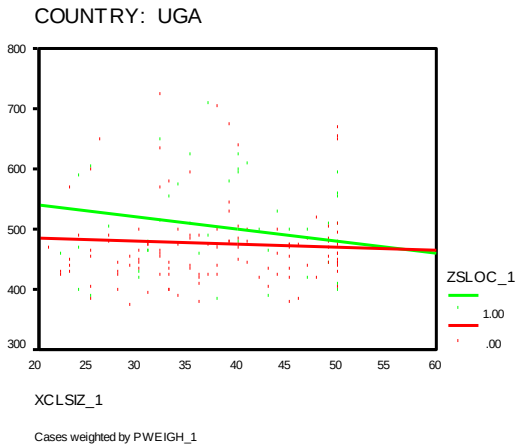
Adjusted score



Cases weighted by PWEIGH_1

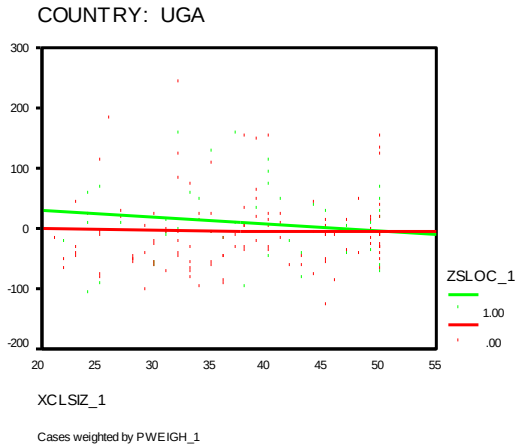
Uganda

Raw score



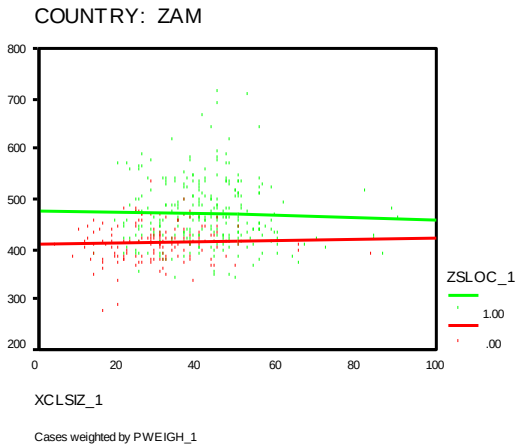
Cases weighted by PWEIGH_1

Adjusted score



Zambia

Raw score



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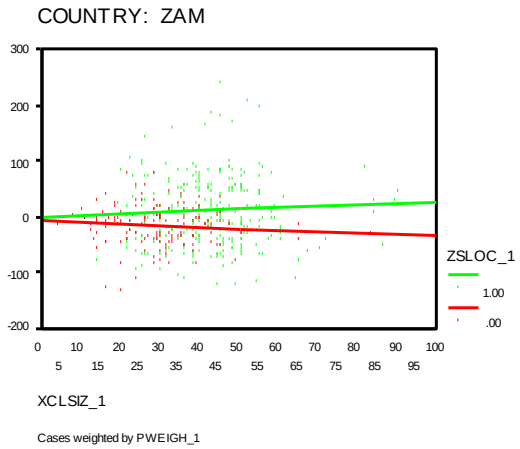
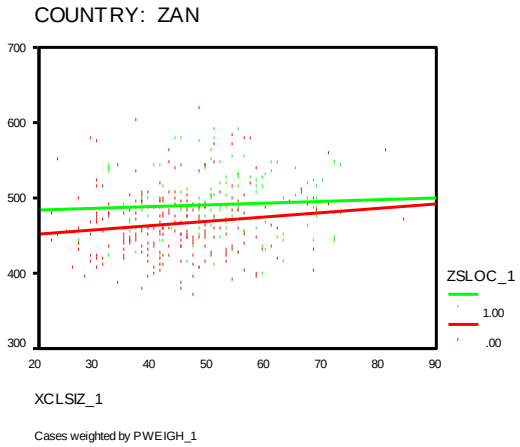


Zanzibar

Raw score



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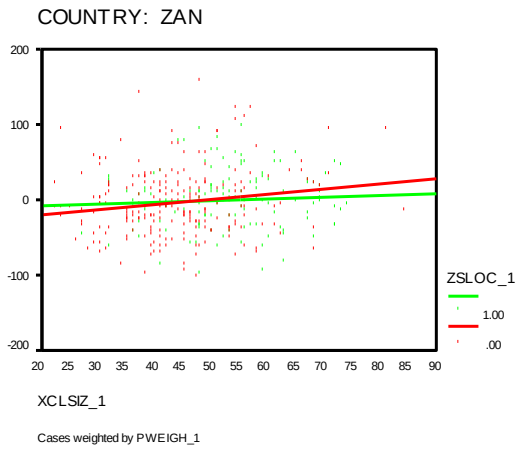
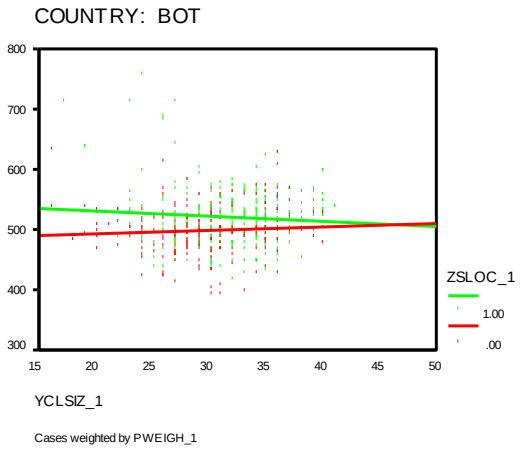


Mathematics

Botswana

Raw score



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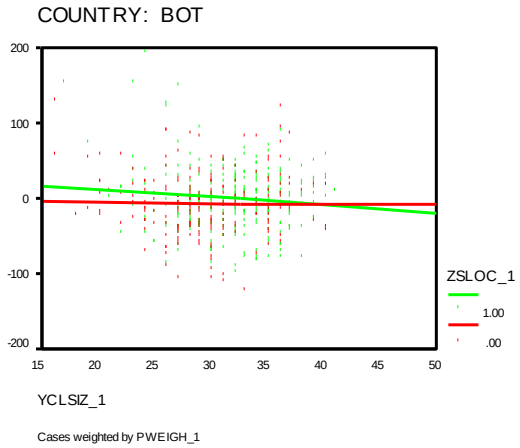
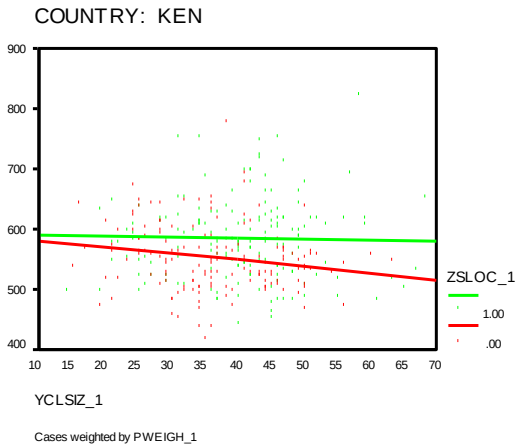


Kenya

Raw score



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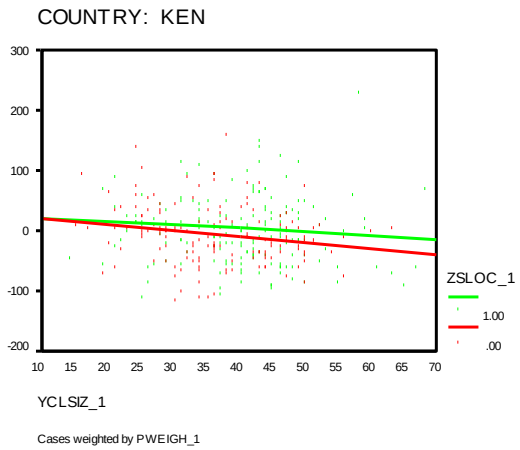
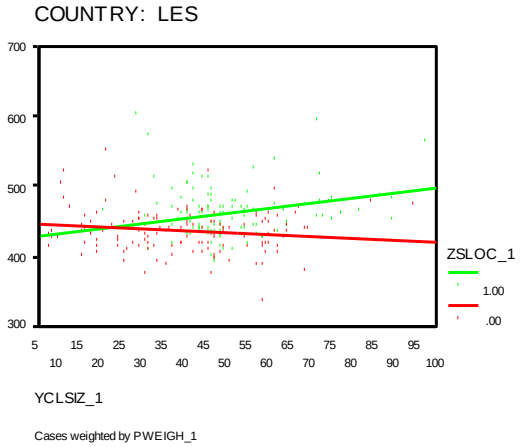
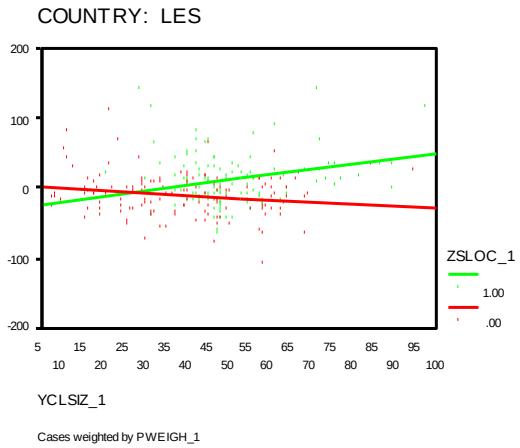


Lesotho

Raw score

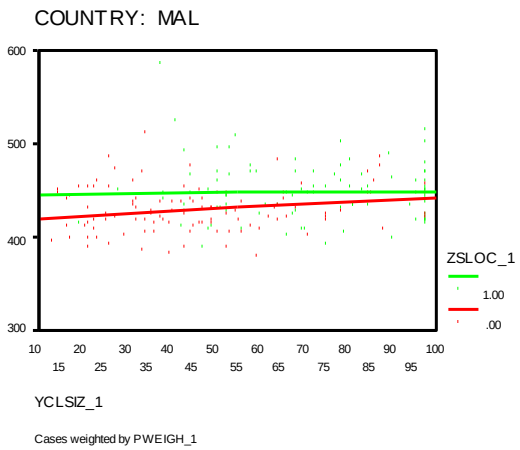


Adjusted score

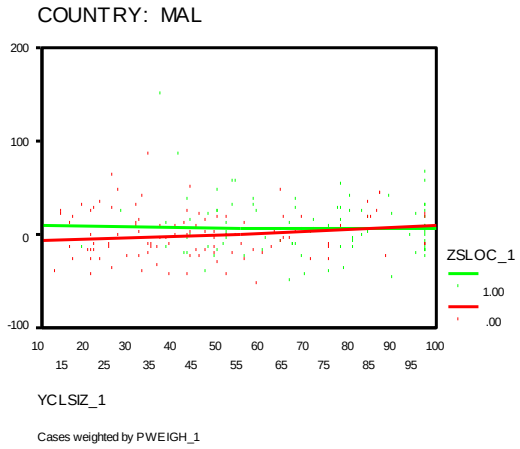


Malawi

Raw score

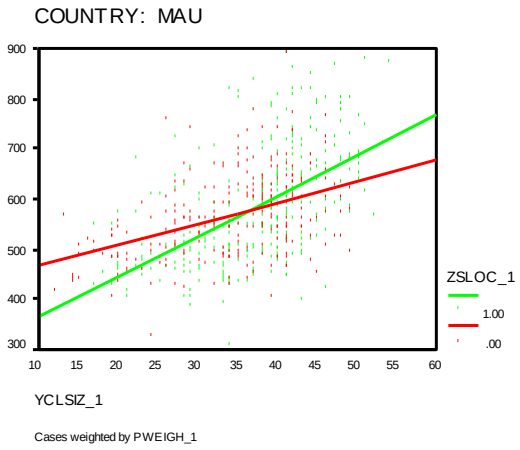


Adjusted score



Mauritius

Raw score



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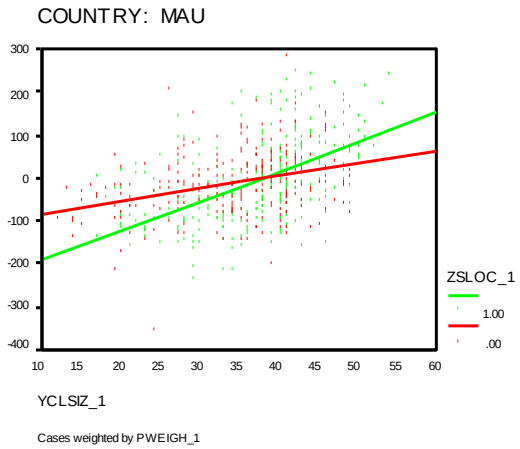
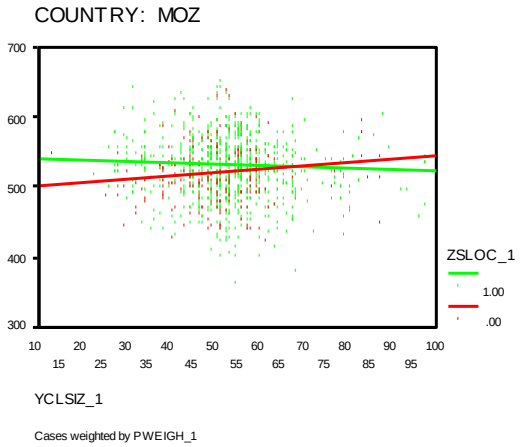


Mozambique

Raw score



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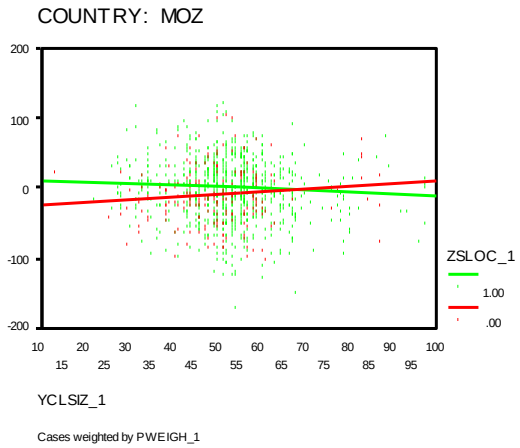
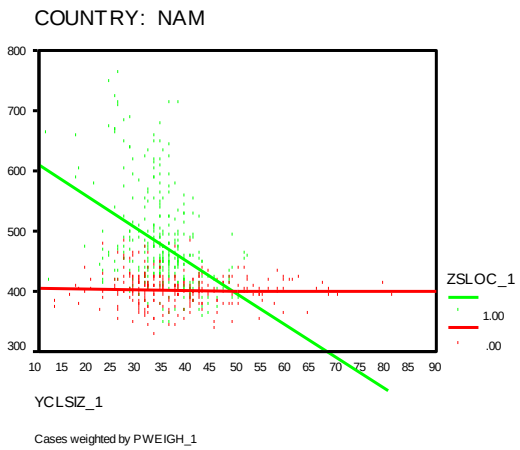


Namibia

Raw score



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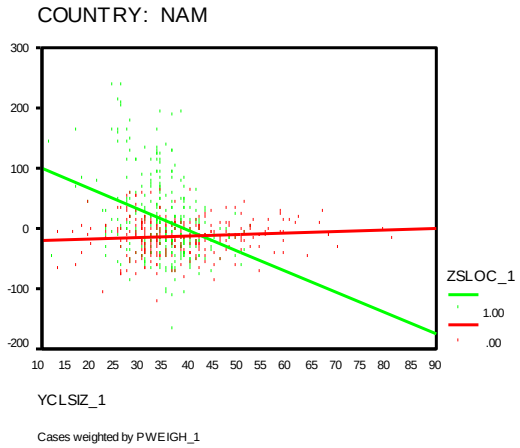
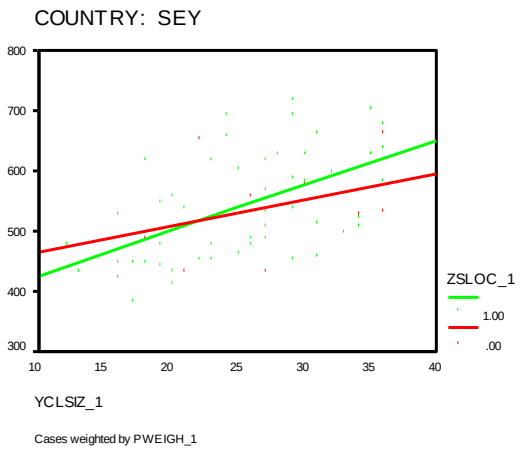


Seychelles

Raw score



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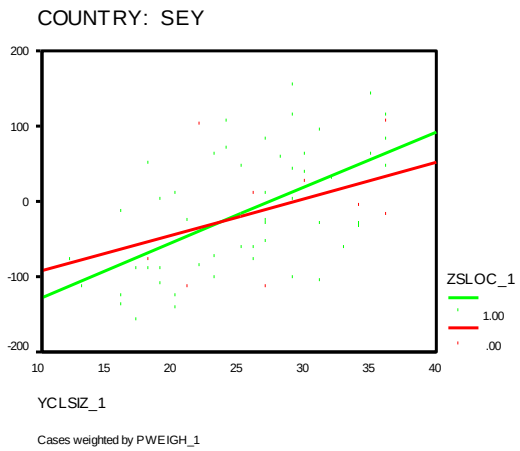
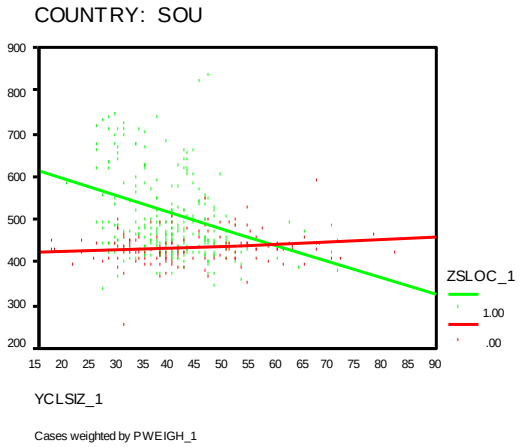


South Africa

Raw score



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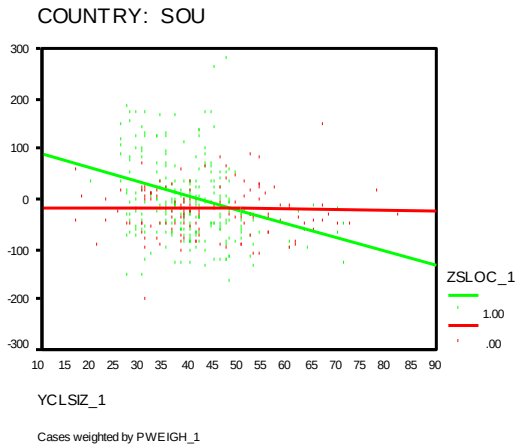
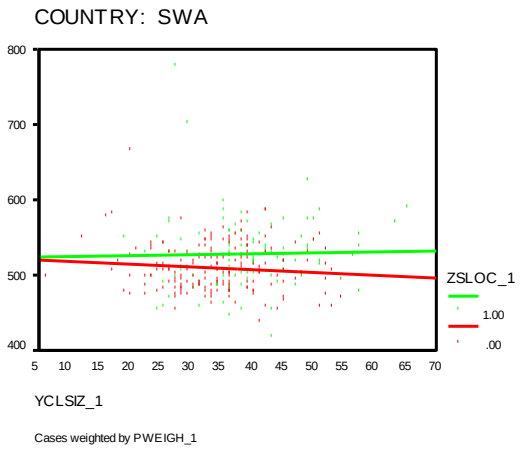


Swaziland

Raw score



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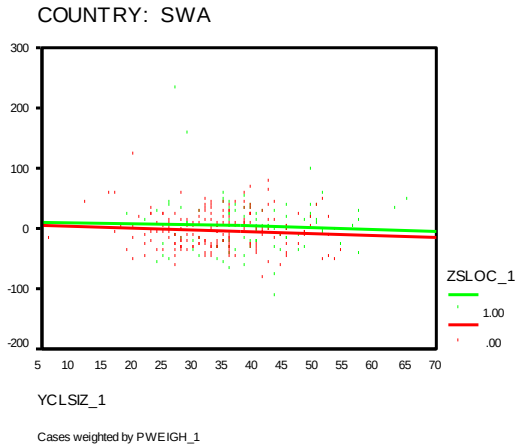
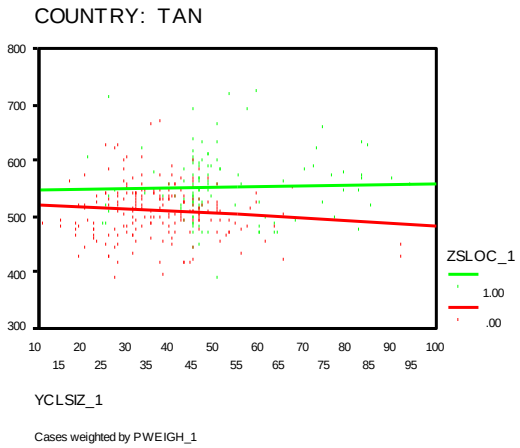


Tanzania

Raw score



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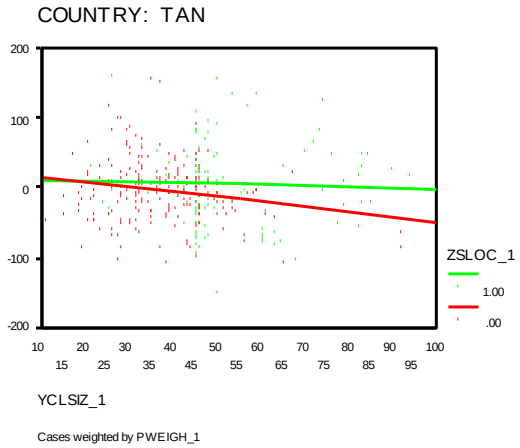
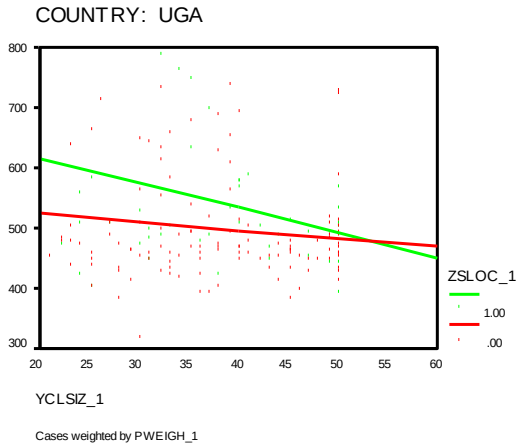


Uganda

Raw score



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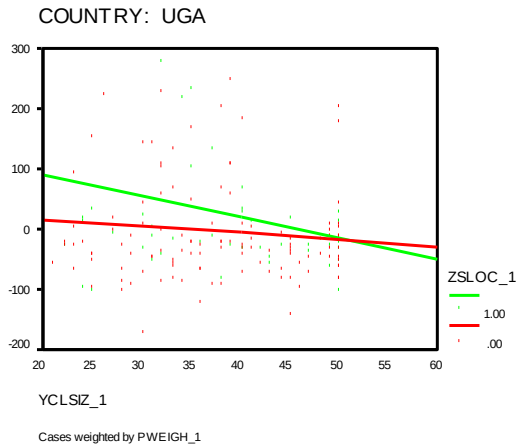
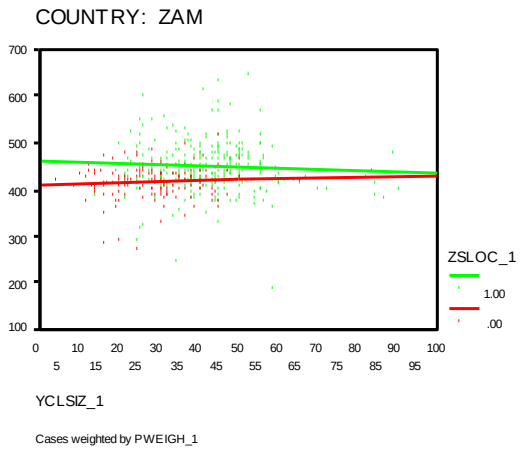


Zambia

Raw score



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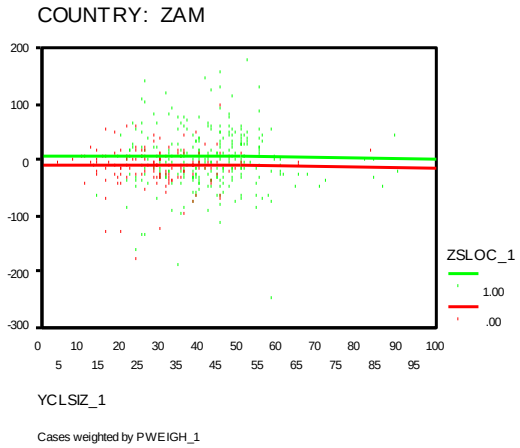
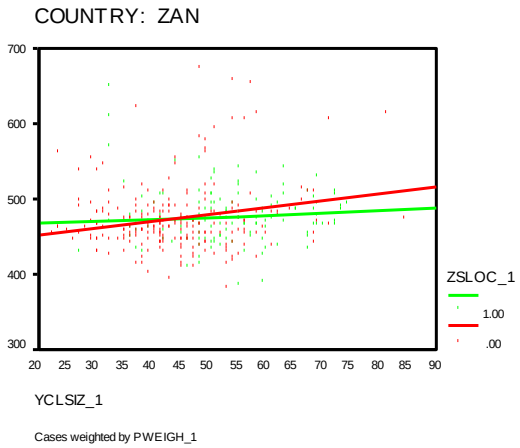


Zanzibar

Raw score



Adjusted score