Namibian Journal for Research, Science and Technology

The Absolute and Relative Quality of the Namibian Secondary Education: A distributional approach on grade 12 (NSSCH) performance

HJ Sartorius von Bach & KM Kalundu

Department of Agricultural Economics, Faculty of Agriculture and Natural Resources, University of Namibia

svonbach@unam.na Tel: +264 (61) 206 4043;

skalundu@unam.na; Tel: +264 (61) 206 4015

ARTICLE INFO

ABSTRACT

The Namibian independence in 1990 imparted a massive challenge to reform education and to refresh the system. Each child had to receive a fair chance to succeed in secondary education, fostering the country's human-capital formation to improve economic performance. In this study uses data from 1996 to 2018 period to analyse the Secondary Education system in order to determine the systems' progress by hypothesizing that educational output is attributed to spatial location, resource allocation and other opportunities. Results show that on a national basis, the average student performance declined. On regional level, results reveal that, (i) general access to secondary education improved significantly, (ii) the educational level of secondary education as reflected in the student points declined continuously, (iii) the narrowing performance variation did not contribute to the national goals, and (iv) that further attention is required to reach the goal of educational democracy. The findings give signals to the need that should urgently assess the drivers of human capital that enables the links secondary education output to economic achievements. On a macro level, the paper shows that, after two decades, the education reform slowly started to show positive results. Meanwhile, on a micro level, the analysis showed that both types of schools and educational support per student explain the level of secondary educational output, which would result into human capital.

Introduction

All over the world, countries prosper when students are adequately prepared for job opportunities, both in expectations and in abilities. Therefore, investment in the Namibian education system remains important to improve outputs and should pay off in terms of higher productivity to generate economic wealth[2]. The paper evaluates the outcomes of high school performance as corner stone to human capital[3] formation, necessary to matures into economic performance to relief structural unemployment (Altbeker & Storme, 2013).

The paper uses the Namibian Secondary Education outputs to show the need for adjusting systems for development. Available literature shows a relationship between student performance and the socio-economic status, and describes how individual student characteristics are associated with status and performance. Often this performance is attributed to resource allocation and opportunities provided for learners with different socio-economic profiles. Therefore, government investment in health, education and infrastructure development are regarded as drivers of human capital (Shuaibu, & Oladayo, 2016). However, other factors also contribute to human capital, for example, human and social skills, emotional intelligence, judgement, personality, habits, creativity and many more.

Since national education systems are complex, they require continuous adjustment and are the focus of many expectations4 (Dashbord, 2012). World Bank (2014)

requires an appropriate measure to ensure that any system consistently meet specific requirements to guide across schools. These differences between schools need to be understood, especially in developing countries with a higher variation of socio-economic circumstances of learners, teachers and the school locations. In Namibia, the educational skewness can be attributed to its historic development, which resulted into a large degree of residential segregation, based on household income, cultural and/or ethnic background. School performance historically differed because of different levels of support by authorities responsible for education.

Scope of the Namibian Secondary Education

Development of support measures towards education allows for improved performance and access to knowledge. This was not the case in Namibia, and was perceived as massive challenge to reform education and to refresh the system. Decision makers saw this as an opportunity to make progress on the long-awaited rights to people, free access to education, equity and equal opportunities, and affirmative measures. However, these aspirations remain noble and require measured success (Mendelsohn, 1997). Consequently, the educational development was guided by four broad goals, namely access, equity, quality and democracy, as reflected in the in the Constitution and National Development Plans[5]. The Namibian government created one unified structure for education with English as the

---

[1] Employability of graduates, and the equilibrium between supply and demand of job applicants
[2] https://www.britannica.com/topic/human-capital
[3] Human Capital is a measure of the skills, education, capacity and attributes of behavior
[4] Producing responsible and productive citizens to boost its nation's standing in science and technology and its position with respect to national economic competitors

[5] Advocate poverty reduction through education and accords a high priority to the provision of education and learning in Namibia. Based on the Constitution, under Article 20, it states that all persons have the right to education. Furthermore, the Universal Declaration on Human Rights under Article 26 protects the right of the child to education, stating that everyone has the right to education and that education shall be free.

medium of instruction and introduced in 1995 (Katjavivi, 2016). The Government developed initiatives within a policy framework for the Education Sector Improvement Programme, to improve quality and efficiency in the sector and to align education with Namibia's Vision 2030 to ensure that the future society will be made up of literate, skilled, articulate, innovative, informed and proactive Namibians.The Cambridge (IGCSE) system was introduced for High School students. Since it was UK based, it was believed that the system would provide an international passport to progression and success. In Namibia, the Cambridge Secondary offered two routes, the Cambridge IGCSE and Cambridge O Level, referred to as the Namibia Senior Secondary Certificate O and H levels (NSSCO and NSSCH).

The maximum points for six subjects are 54. The basic entrance to an undergraduate degree requires five subjects passed (inclusive of English) in not more than three examination sittings, with a minimum of 25 points obtained collectively from NSSCO and/or NSSCH level subjects. In reality however, because of limited tertiary study places available, the required point to gain access to a degree is much higher, such as 33 points for a BSc or 37 for a degree in medicine.

Access to secondary education increased significantly[6]. The number of grade 12 enrolments for NSSCH alone increased form 904 in 1996 to 17 968 in 22 years. This is twentyfold while the national population only grew annually by 3.8% and can therefore be classified as great achievement necessary for human capital. It is a great achievement regarding access to education and intentional building of human capital.

Table 1: National access to grade 12 education in Namibia (1996 - 2018)

Year	NSSCH	NSSCO	Namibian population	NSSCH /population	NSSCO /population
1996	904	11 789	1 706 000	0.05%	0.69%
1999	1 170	11 088	1 858 000	0.06%	0.60%
2005	3 463	13 850	2 032 000	0.17%	0.68%
2009	7 784	17 225	2 137 000	0.36%	0.81%
2013	11 728	19 501	2 213 077	0.56%	0.92%
2018	17 968	23 594	2 454 000	0.73%	0.96%

Source: National Media Holdings (2018) and
http://www.citypopulation.de/Namibia.html

The increase in grade 12 students has to be compared in relation to the national and regional population size. Table 1 provides an overview of the increase in grade 12 students since 1996 to 2018, the Namibian population, and the national percentages of NSSCH and NSSCO students. Evidence shows that national access to education increased significant over time to reach an almost demographically possible level. From the human capital perspective, it is outstanding to note that the access to higher level subjects increased more than the rate of ordinary level. This gap between NSSCH/population and NSSCO/population reduced from 0.64% to 0.23% within 2 decades. However, the average students' total point[7] obtained for NSSCH subjects decreased from 20.1 points in 1999 to 8.55 in 2013 and increased marginally to 9.99 in 2018. In order to find the cause of the decline, averages were disaggregated into categories of non-performers (below 15 points) and top performers (above 39 points). Figure 1 provides a concerning trend, namely that, the relative proportion of national non-performers increased during the past 2 decades and that the national top performers are becoming less by the year.

---

[6] Access to Secondary education is defined as students passed the Grade 10 exam and were allowed to continue their school education

[7] Maximum is 54 points

Figure 1: Observed NSSCH results (additive) for selected years
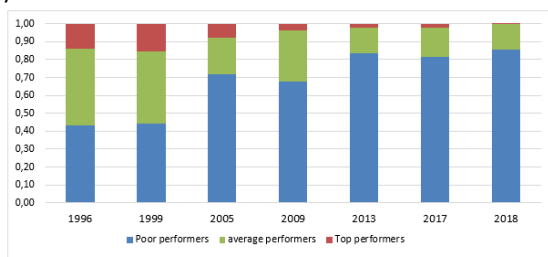
Methods

The annual Namibian Secondary Education results can be used to analyze human capital formation both quantitatively and qualitatively (see Mayston, 2013). Based on the New Zealand study by Tooley & Guthrie (2017), it was hypothesized that a change in educational system would not result into desired outcomes after 2 decades to yield expected efficiency and educational quality gains.

The annual NSSCH points were used as proxy for the changing educational outcome and development over time for the years 1991 (just after independence), 1996 (the year when the new system started), 1999, 2005, 2009, 2013 and 2018. Data for 1991 were different from the rest, as it was based on the pre-independence system providing 1 059 grade 12 students. Since the 1996, the system changed to Cambridge requiring 6 subjects for each individual student to present separate grades and symbols.

Besides national and regional differences, the effect of the educational head quarter as functional node of national education and urban geography was applied on secondary education (Sartorius von Bach, 2018).

This application was based on Christaller's Central Place Theory and on urban economics. The assessment presents the differences in performance between types of schools within the functional node to determine how central performance compares with the remaining regions to determine regional progress in reaching the stage of delivering performing students to the pool of expertise, for example, whether investments into decentralized education slowly starts to pay off. Views on human capital from Theodor Schultz (1961), Becker (1964), Gardener (1983), Nelson and Phelps (1966) Spence (1973) and Bourdieu (1986) was referenced to realize that formation in human capital is essential for the social upbringing of the youth.

It was necessary to disaggregate national grade 12 school results into regional results to understand where and how disparities originate for possible adjustments of human capital. Because of the volume of the data, years were randomly selected to present absolute and relative changes. The paper hypothesized that regional disparities after 2 decades still explain a relative large share of differences in performance among students. Student grade NSSCH level (range 1 - 4) was transformed into points to use the total individual student point. These student marks were grouped by regions, to determine the enrolment number, performance and the regional skewness of these student points. From the different skewness measures, the Herfindahl measure was selected (Herrmann, 1985) to determine absolute skewness. The changes in were transformed to indexes for trend and regional comparison purpose.

$$H = \left(\sum_{i=1}^{n} x_i^2\right) / \left(\sum_{i=1}^{n} x_i\right)^2 \qquad \text{where } 1/n \leq H \leq 1 \qquad (1)$$

The data were transformed from longitudinal into distributional data, i.e. the number of NSSCH students were grouped into the 54 possible grade 12 performance outcomes. These groupings were applied for years, regions and in case of Khomas for private vs government schools. The Pearsons correlation were used to explain the situation, with forthcoming indices to explain the trends from NSSCH between 1996 and 2018. The Pearson correlation is defined by the following expression:

$$r_{xy} = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)\left(y_i - \bar{y}\right)}{\sqrt{\sum_{i=1}^{n}\left(\left(x_i - \bar{x}\right)\right)^2}\sqrt{\sum_{i=1}^{n}\left(\left(y_i - \bar{y}\right)\right)^2}} \qquad (2)$$

Where

- n = sample size,
- x_i, y_i are individual variables indexed with i
- $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ is a sample mean analogously defined for $\bar{y}$

An equivalent expression gives the formula for r_{xy} as follows:

$$r_{xy} = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i - \bar{x}}{S_x}\right)\left(\frac{y_i - \bar{y}}{S_y}\right) \qquad (3)$$

Where $\left(\frac{x_i - \bar{x}}{S_x}\right)$ is standard score and analogously for the standard score of y.

Equation expressed in (2) and (3) yields the same correlation. A value of 1 implies perfect positive relationship between variables and a negative value implies the opposite, whilst a 0 value indicates non-existence of relationship among variables of interest.

The paper followed an approach to present trends of national outcome and to disaggregate them into regional analysis to determine educational access to grade 12, performance, distribution of performance and educational democracy.
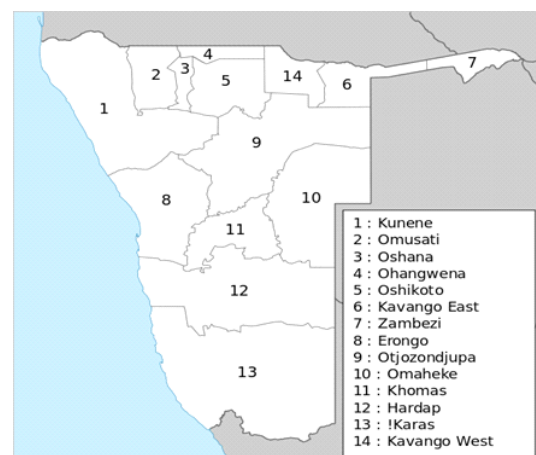
A trend analysis and school differences were used to explain the status of secondary education in Namibia, based on suggestions by De Witte & Lopez-Torres (2017).

Results and discussion

Access to Secondary Education

On the regional level, Table 2 summarizes the students' enrolments in the higher level subjects for the years 2013 and 2017. These numbers are compared to regional population numbers to determine educational access concentration to higher level subjects. Map 1 of Namibia provides an overview of the location of the regions.

Map 1: Regions of Namibia

1 : Kunene
2 : Omusati
3 : Oshana
4 : Ohangwena
5 : Oshikoto
6 : Kavango East
7 : Zambezi
8 : Erongo
9 : Otjozondjupa
10 : Omaheke
11 : Khomas
12 : Hardap
13 : !Karas
14 : Kavango West

Only the Omusati region reached an enrolment of above 3 000 students in 2018, which was as high as 1.23 of the population size. T-tests showed that educational access in Namibia can be significantly divided in three groups, probably because of historic remnants.

During the past 5 years, it is clear that the highest access was found in regions Omusati, Oshana, Zambezi, Ohangwena, and Oshikoto, while the lowest secondary school access was found in Kunene, Omaheke and Otjozondjupa.

Table 2: Regional access to Grade 12 higher level subjects

Region	NSSCH students / regional population	
	2013	2017
‖Karas	0.30%	0.30%
Hardap	0.10%	0.17%
Omaheke	0.08%	0.08%
Khomas	0.46%	0.45%
Erongo	0.28%	0.25%
Otjozondjupa	0.10%	0.11%
Kunene	0.06%	0.07%
Omusati	1.14%	1.23%
Oshana	1.14%	1.17%
Kavango	0.39%	0.66%
Ohangwena	0.68%	0.84%
Oshikoto	0.61%	0.80%
Zambezi	0.42%	1.46%
National	0.56%	0.69%

Source: Author's estimation, 2019.

Educational Quality

The educational quality was measured by grade 12 NSSCH average total points per student and was grouped per region over two decades. Table 3 showed the national NSSCH results. The correlation between performance and the points obtained is negative, showing that the opposite related the number of students obtaining these points. The years with statistical significant correlations was 1996, 1999, 2013 and 2018 at 10% level. The trend was depicted with an index, showing that the national performance increased from 86 to 107 in 1999 and declined since to a current index of 94. Since not all years showed significant correlations, the individual contributors were assessed to understand these trends.

Table 3: National performance of grade 12 higher level subjects

Student: Performance	National	1996	1999	2005	2009	2013	2018
Pearson Correlation	-0.3064	-0.3582	-0.29982	-0.2873	-0.2914	-0.2945	-0.3184
Students	43017	904	1170	3463	7784	11728	17968
P(T<= t) two-tail	0.03656	0.0059	0.1806	0.1867	0.1180	0.0877	0.0539
t Critical two-tail	2.0048						
Index	100	86	102	107	105	104	96

Source: Author's estimation from equations 2 and 3, 2019

No clear conclusion can be made from Table 3. However, transferring the aggregate data on a normal distribution, it becomes clear that the distribution becomes narrow and that the performance declines. The disaggregation of national high school performance into regional contribution is required to understand this alarming trend. Table 4 presents the regional performance based on distributional trends and provided performance ranking from 139 to 78. In general, urbanized schools performed better than schools in rural areas, which correspond to Viteritti (1999) that competition reduces barriers by delinking residence from schooling opportunity (see Nathan, 1998). It is concerning that the average performance of the regions in Khomas, Hardap, Omaheke, Erongo, Otjozondjupa, and Zambezi are decreasing. The opposite takes place during the past decade for ‖Karas, Kunene, Oshana, Omusati, and Kavango. The analysis based on absolute measures shows that the average regional education performance between 1999 and 2009 was the highest ever within the past 2 decades. It might be the result of superior skill management within the system. It is suggested to determine the origin of the high variation in performance, to be corrected for increased human capital formation. This is captured in figure 2.

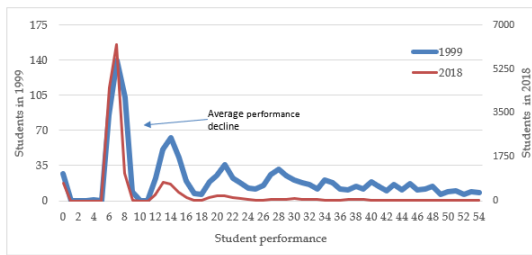**Figure 2:** Distributional performance, 2 decades later

Table 4: Regional contribution towards national performance of Grade 12 NSSCH

Student Performance by region	Parameters	1996	1999	2005	2009	2013	2018	Average Performance index
ǁKaras	Pearson Corr.	-0.369	-0.349	-0.420	-0.383	-0.467	-0.421	78
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.000	
	Index	97.026	85.824	68.476	76.178	63.029	75.606	
Hardap	Pearson Corr.	-0.424	-0.283	-0.329	-0.341	-0.330	-0.407	88
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.000	
	Index	84.418	105.916	87.209	85.353	89.259	78.310	
Khomas	Pearson Corr.	-0.265	-0.183	-0.242	-0.332	-0.370	-0.377	139
	P(T<=t) two-tail	0.000	0.000	0.019	0.260	0.731	0.370	
	Index	135.214	163.522	118.719				
Omaheke	Pearson Corr.	-0.292	-0.205	-0.282	-0.175	-0.300	-0.357	121
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.000	
	Index	122.701	146.611	101.906	166.847	98.207	89.228	
Erongo	Pearson Corr.	-0.268	-0.274	-0.296	-0.221	-0.393	-0.363	106
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.002	
	Index	133.831	109.475	97.012	131.948	74.845	87.654	
Otjozondjupa	Pearson Corr.	-0.308	-0.308	-0.287	-0.258	-0.316	-0.391	100
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.000	
	Index	116.304	97.348	100.129	112.839	93.055	81.523	
Kunene	Pearson Corr.			-0.272	-0.399	-0.465	-0.364	82
	P(T<=t) two-tail			0.000	0.000	0.000	0.000	
	Index			105.469	73.023	63.323	87.480	
Omusati	Pearson Corr.				-0.270	-0.274	-0.296	
	P(T<=t) two-tail				0.873	0.465	0.310	
	Index							
Oshana	Pearson Corr.		-0.375	-0.286	-0.275	-0.270	-0.302	90
	P(T<=t) two-tail		0.000	0.000	0.700	0.680	0.512	
	Index		80.030	100.388				
Oshikoto	Pearson Corr.	-0.268	-0.225	-0.275	-0.283	-0.253	-0.292	124
	P(T<=t) two-tail	0.000	0.000	0.023	0.197	0.585	0.739	
	Index	133.903	133.261	104.561				
Ohangwena	Pearson Corr.			-0.244	-0.270	-0.274	-0.284	113
	P(T<=t) two-tail			0.001	0.003	0.870	0.487	
	Index			117.540	107.785			
Kavango	Pearson Corr.		-0.271	-0.273	-0.279	-0.275	-0.333	107
	P(T<=t) two-tail		0.000	0.000	0.001	0.144	0.913	
	Index		110.803	105.358	104.528			
Zambezi	Pearson Corr.	-0.345	-0.030	-0.335	-0.414	-0.294	-0.305	90
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.953	
	Index	103.894		85.811	70.362	100.180		

Author's estimation based on equation 2 and 3, 2019.

The earlier referenced Figure 2 already provided the skewness of performance. However, for the completeness of the analysis, the average student points had to be provided to gain a complete understanding of performance. Table 5 shows the suggested trend and continues to disaggregate the performance into categories poor, middle and high performers presented in Figure 1.

Table 5: Regional average total student points during the past 2 decades

Regions	1996	1999	2005	2009	2013	2018	Normalized relative ranking
ǁKaras	14.02	13.92	13.29	10.85	11.22	11.88	7
Hardap	15.41	17.83	14.66	16.32	11.96	9.29	5
Omaheke	14.71	20.40	13.98	16.96	12.46	10.95	4
Khomas	23.02	24.47	21.81	19.42	18.33	15.73	1
Erongo	20.94	18.98	18.87	20.54	15.19	12.84	3
Otjozondjupa	18.01	21.61	19.60	20.78	19.79	12.87	2
Kunene			6.64	9.25	9.87	7.67	11
Oshana		13.12	9.00	7.52	7.89	9.12	10
Omusati			7.06	7.24	8.29		13
Kavango		9.85	8.58	9.48	9.71	10.70	9
Ohangwena			6.86	6.22	6.96	7.55	12
Oshikoto	18.32	17.77	8.99	9.07	9.79	9.52	8
Zambezi	8.47	25.85	15.47	10.18	11.25	9.53	6

Source: Author's estimation, 2019

Figure 1 presents the observed relative number of top performers over the years, in which each region contributes to the total national share. It is interesting to note that during the first decade, the urbanized Khomas region alone contributed approximately 20% to the group of top performers, but that this contribution declined to 9.7% during the second decade. The Otjozondjupa and Erongo regions showed a similar trend, while other regions, which produced top performers during the first decade does not produce top performers anymore. Statistical modeling shows that regional output can be grouped to areas , which could be interpreted that educational system management were not applied equally.

It is clear from this section that general performance learners at senior secondary level converged in a narrowed skewed distributional envelope. The envelope is discussed in the next section.

Educational distribution by number and performance

The inclusion of students with different socio-economic status to attend the same school has been suggested as the most effective way to improve equity in both the short and long term (Eaton, 2001). Each student performance was measured in absolute skewness to determine the educational goal of equity. The educational equity narrowed (see Figure 2). Table 6 determines the variation on regional basis.

The regional Herfindahl measure followed the same trend as the regional variation of performance. Especially the regions Omusati, Ohangwena, Oshana, and Khomas showed that variation of performance narrows. The measures were adjusted into trends to make comparisons easier. A concerning trend was found, namely that that while performance in general is declining (see Table 6 and Figure 3), this is strengthened by narrowing the points into a template of decreasing skewness. The only regions which kept their higher variance of student performance were Omaheke, Hardap, and Kunene . It is clear that regions Kunene, Omaheke, Otjozondjupa, Omaheke and Hardap require further attention to reach the education democracy goal (see also Tikly & Barrett, 2009) . Example of skewness are that for example only 1 student of 1 495 Kunene citizens enrolled for NSSCH, while in the Omusati region the enrolment was 1 student per 81 citizens .

Although it may be hypothesized that educational output differs according to regional support, it appears that regions' response is probably a consequence of historic barring. The Namibian relative skewness compares well with South African learners (Gamede, 2017).

Table 6: Performance and enrolment skewness during the past 2 decades

Variation of performance		1996	1999	2005	2009	2013	2018	average
National	Herfindahl	0.0487	0.0356	0.0207	0.0103	0.0099	0.0062	
	Index	45	61	106	214	222	352	167
IIKaras	Herfindahl	0.0263	0.0270	0.0208	0.0130	0.0071	0.0046	
	Index	185	133	99	79	139	136	129
	Student Nr	49	62	86	143	235	339	
Hardap	Herfindahl	0.0320	0.0483	0.0233	0.0185	0.0197	0.0084	
	Index	152	74	89	55	50	74	83
	Student Nr	46	29	67	90	83	178	
Khomas	Herfindahl	0.0036	0.0028	0.0019	0.0017	0.0013	0.0038	
	Index	1370	1282	1082	600	736	162	872
	Student Nr	591	640	990	1250	1569	2040	
Omaheke	Herfindahl	0.1015	0.0882	0.0496	0.0378	0.0327	0.0203	
	Index	48	41	42	27	30	31	36
	Student Nr	14	15	41	54	58	85	
Erongo	Herfindahl	0.0220	0.0126	0.0078	0.0073	0.0039	0.0029	
	Index	222	284	267	141	252	217	231
	Student Nr	63	120	192	203	422	624	
Otjozondjupa	Herfindahl	0.0174	0.0121	0.0203	0.0131	0.0113	0.0114	
	Index	279	295	102	78	88	54	150
	Student Nr	89	115	68	116	137	185	
Kunene	Herfindahl			0.0918	0.0234	0.0275	0.0250	
	Index			23	44	36	25	32
	Student Nr			11	57	55	46	
Omusati	Herfindahl				0.0007	0.0005	0.0004	
	Index				1375	2047	1390	1604
	Student Nr				1664	2784	3433	
Oshana	Herfindahl			0.0046	0.0012	0.0007	0.0007	

Source: Author's estimation, 2019

Figure 1 presents the observed relative number of top performers over the years, in which each region contributes to the total national share. It is interesting to note that during the first decade, the urbanized Khomas region alone contributed approximately 20% to the group of top performers, but that this contribution declined to 9.7% during the second decade. The Otjozondjupa and Erongo regions showed a similar trend, while other regions, which produced top performers during the first decade does not produce top performers anymore. Statistical modeling shows that regional output can be grouped to areas , which could be interpreted that educational system management were not applied equally.

It is clear from this section that general performance learners at senior secondary level converged in a narrowed skewed distributional envelope. The envelope is discussed in the next section.

Educational distribution by number and performance

The inclusion of students with different socio-economic status to attend the same school has been suggested as the most effective way to improve equity in both the short and long term (Eaton, 2001). Each student performance was measured in absolute skewness to determine the educational goal of equity. The educational equity narrowed (see Figure 2). Table 6 determines the variation on regional basis.

The regional Herfindahl measure followed the same trend as the regional variation of performance. Especially the regions Omusati, Ohangwena, Oshana, and Khomas showed that variation of performance narrows. The measures were adjusted into trends to make comparisons easier. A concerning trend was found, namely that that while performance in general is declining (see Table 6 and Figure 3), this is strengthened by narrowing the points into a template of decreasing skewness. The only regions which kept their higher variance of student performance were Omaheke, Hardap, and Kunene . It is clear that regions Kunene, Omaheke, Otjozondjupa, Omaheke and Hardap require further attention to reach the education democracy goal (see also Tikly & Barrett, 2009).

Example of skewness are that for example only 1 student of 1 495 Kunene citizens enrolled for NSSCH, while in the Omusati region the enrolment was 1 student per 81 citizens . Although it may be hypothesized that educational output differs according to regional support, it appears that regions' response is probably a consequence of historic barring. The Namibian relative skewness compares well with South African learners (Gamede, 2017).

Table 6: Performance and enrolment skewness during the past 2 decades

| Variation of performance		1996	1999	2005	2009	2013	2018	average
National	Herfindahl	0.0487	0.0358	0.0207	0.0103	0.0099	0.0062	
	Index	45	61	106	214	222	352	167
||Karas	Herfindahl	0.0263	0.0270	0.0208	0.0130	0.0071	0.0046	
	Index	185	133	99	79	139	136	129
	Student Nr	49	62	86	143	235	339	
Hardap	Herfindahl	0.0320	0.0483	0.0233	0.0185	0.0197	0.0084	
	Index	152	74	89	55	50	74	83
	Student Nr	46	29	67	90	83	178	
Khomas	Herfindahl	0.0036	0.0028	0.0019	0.0017	0.0013	0.0038	
	Index	1370	1282	1082	600	736	162	872
	Student Nr	591	640	990	1250	1569	2040	
Omaheke	Herfindahl	0.1015	0.0882	0.0496	0.0378	0.0327	0.0203	
	Index	48	41	42	27	30	31	36
	Student Nr	14	15	41	54	58	85	
Erongo	Herfindahl	0.0220	0.0126	0.0078	0.0073	0.0039	0.0029	
	Index	222	284	267	141	252	217	231
	Student Nr	63	120	192	203	422	624	
Otjozondjupa	Herfindahl	0.0174	0.0121	0.0203	0.0131	0.0113	0.0114	
	Index	279	295	102	78	88	54	150
	Student Nr	89	115	68	116	137	185	
Kunene	Herfindahl			0.0918	0.0234	0.0275	0.0250	
	Index			23	44	36	25	32
	Student Nr			11	57	55	46	
Omusati	Herfindahl			0.0007	0.0005	0.0004		
	Index			1375	2047	1390		1604
	Student Nr			1664	2784	3433		
Oshana	Herfindahl			0.0046	0.0012	0.0007	0.0007	
	Index			447	828	1368	918	890
	Student Nr			287	1192	2013	2287	
Oshikoto	Herfindahl	0.0647	0.0270	0.0025	0.0019	0.0177	0.0009	
	Index	60	46	13	40	399	51	101
	Student Nr	25	56	592	836	1117	1845	
Ohangwena	Herfindahl			0.0028	0.0024	0.0007	0.0006	
	Index			743	423	1493	1079	935
	Student Nr			370	433	1665	2572	
Kavango	Herfindahl		0.0247	0.0039	0.0034	0.0017	0.0011	
	Index		145	529	305	597	581	432
	Student Nr		54	380	463	873	1552	
Zambezi	Herfindahl	0.1225	0.0795	0.0194	0.0089	0.0037	0.0009	
	Index	40	45	107	115	265	728	217
	Student Nr	15	13	66	157	376	1435	

Author's estimation based on equation 2 and 3, 2019

Educational performance between schools and regions

A trend analysis of educational performance between the urban node of Namibia (the Khomas region with its capital city of Windhoek), and the remaining regions with rural characteristics were presented in Figure 5. School classifications were compared between private and government schools within the functional node. Disaggregating the private schools from the government schools, it is interesting to observe that private NSSCH schools are performing much better, both in absolute and relative terms. It is probably a contributing cause that the educational performance of the functional node was better than the other regions. Empirical evidence shows that Khomas government schools lost their share of producing top performers, and unfortunately increased their number of poor performers. This contradicts the economic theory for the functional node but corresponds to the national trend. Private schools in the Khomas region increased their share of top performers relative to the government schools.

Figure 5 also illustrates budget allocation per student for the past 13 years. Salaries were deducted from total secondary education budget to determine the amount available for available educational resource. This availability was divided by the total number of grade 12 students as proxy for average resource availability per student. An index was used to compare values in Figure 3. There exist association between resource availability per student and the decline of student performance in general.

Figure 3: Average NSSCH total student points and the allocation of education resource index per student.
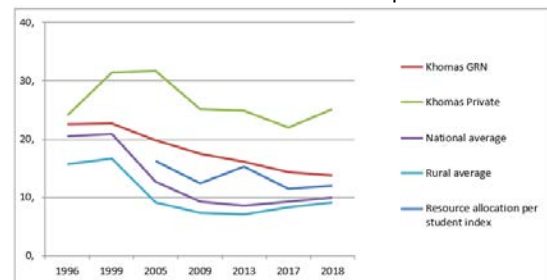
Three distinct phases can be observed in Figure 3. The first phase shows increasing performance output from 1996 to 1999. This could be associated to the outcome of the national education wages and salaries adjustments though WASCOM in 1994. The next phase is the flattening and decline of results until 2013. The declining trend after phase one correspond to an educational authority decision to end their incentive payment for teachers after obtaining their Higher Education Diploma. The trend continued until 2013 when the system could halt the declining points with a slight increase of average marks during the last two years (phase 3). The graph thus points out, that well-paid teachers contribute to improved student performance. It is well known that teachers at private schools earn a higher remuneration, and evidently, using the Khomas example, the private schools out-perform the government schools (see Figure 4). It must be noted, that factors such as availability of educational resources play a significant role to allow performance in secondary education.

Figure 4: Combined total normalized score of Khomas region schools (1996 – 2018)
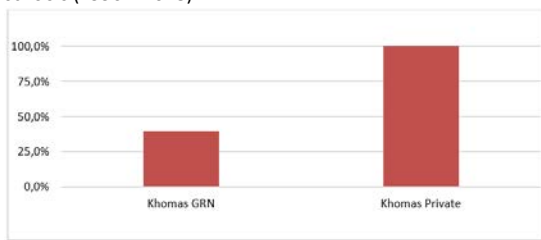
The above disparity is supported in Table 7, which presents the longitudinal performance between private and government schools in the Khomas region. Similar than in the above findings, the performance of both the government and the private schools are declining, they are only not as rapid as other regions. The gap between the types of schools are fluctuating and a general trend is not clear.

Table 7: Performance comparison between types of schools in Khomas region

Student performance		1996	1999	2005	2009	2013	2018	Average
National	Index	85.53	102.19	106.65	105.13	104.03	96.24	99.96
Khomas GRN schools	Pearson Corr.	-0.283	-0.260	-0.304	-0.372	-0.390	-0.415	
	P(T<=t) two-tail	0.000	0.000	0.002	0.027	-0.390	0.334	
	Index	126.54	115.44	94.55	78.39	#	#	104
Khomas Private schools	Pearson Corr.	-0.182	0.319	0.332	-0.088	-0.166	-0.114	
	P(T<=t) two-tail	0.000	0.000	0.000	0.000	0.000	0.000	
	Index	196.79	#	638.12	330.89	177.89	279.66	325
School gap	Index	70.26	#	543.57	252.45	177.89	279.66	220.94

Author's estimation based on equation 2 and 3, 2019

From a spatial economies' perspective, Figure 5 presents the regions human capital formation achievement within the past two decades. The first row presents the situation at Independence at 1991, while the second row the normalized score in the years 2000 to 2018. As expected, the functional node of Khomas performed best and was normalized to 100 percent to compare its performance to the remaining regions . It is not surprising that 29 years after independence, the adjacent and historically supported regions like Otjozondjupa and Erongo also contributed to human capital formation at times prior to system change, while some of the other regions reached the stage of delivering performing students to the pool of expertise. Comparing this achievement with a snapshot of earlier Cape Senior Secondary education system still applied in 1991, it is clear that the regions contributed most to produce performing students were the earlier advantaged regions such as Otjozondjupa, Omaheke and Hardap, while previously disadvantages regions such as Oshana, Omusati and Ohangwena slowly showed that the goal to decentralize education slowly starts to pay off.

Figure 5: Combined score normalized: changes of number of performers after 2 decades of NSSCH
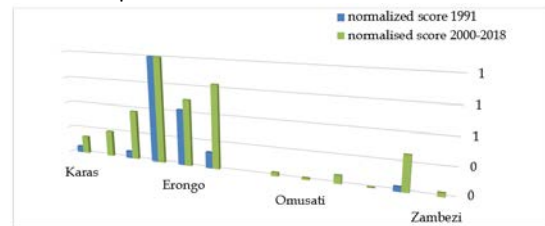
Based on the low averages and decreasing number of top performers, remaining question to be asked is what factors attributes to produce performing students. This was tested on an environment for performance by using a sample of performing regional schools from 2018 as presented in the Table 8.

Table 8: Sample of performing Secondary schools in Namibia during 2018

| Region	Regional average NSSCH	School within region	Funding classification	School average NSSCH	Relative school performance (%)
Khomas	15.74	School A	Private	29.12	185.00
Khomas	15.74	School B	Government	24.51	155.71
Erongo	12.81	School C	Private	26.58	207.49
Otjozondjupa	12.80	School D	Private	39.42	307.96
Omusati	8.29	School E	Government	18.34	221.23
Oshana	9.12	School F	Government	18.14	198.90
Ohangwena	7.55	School G	Government	18.31	242.51
Oshikoto	9.51	School H	Government	26.78	281.59
Kavango East	11.47	School I	Government	28.86	251.61
Kavango East	11.47	School J	Government	40.85	356.15

Source: Author's estimation, 2019

From Table 8, it is clear that on average, these selected schools' averages are almost double than their regional counterparts. Although private schools performed better, some variation exists . The school assessment showed that the average point is the result of the specific schools leadership level. In Namibia, the school principal and the management committee, consisting of parents, are regarded as key to school success and performance. Ploom & Haldma (2013) showed that performing secondary schools in Estonia were influenced by the schools strategic and operational management performance measures. Since the level of management differs between schools, it explains the performance variation, such as the level of school management can be taken as driver towards NSSCH performance and consequently human capital formation.

From the sample taken, the best average performing schools for 2018 was School J followed by School D. It should be noted that both of these schools are located in rural regions, and not in the well-resourced Khomas region. This trend is different to the historic past, when performing schools originated from the urban capital region. During 2018, the best private school Khomas region was School A.

To analyze the school performance, the student's final exam results from 2018 were divided into high performers, poor performers and the middle group. The Figure below clearly shows three school classification types. Although these schools performed well, the classification criteria could be applied to the majority of Namibian schools, who generated less than 1% of top performers in the 2018 academic year. Figure 6 characterizes three types of schools NSSCH performers. The NSSCH performance changes annually and is based on the applied school management level.

Figure 6: Observed NSSCH results (additive 2018)
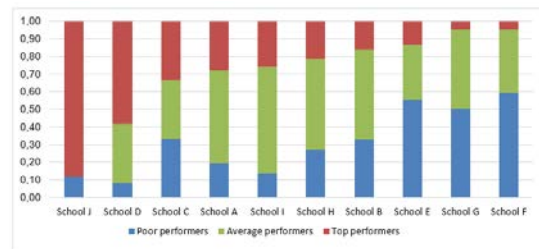
From Figure 6, the following can be noted:

- Type A schools includes Schools J and D, with achieved outputs of which the majority of students are classified as high performers. This was only possible because of their significantly different operational approach used, and not the classification of private or public school. Their success driver can be categorizes as school leadership and guidance from their school board. These performed 3 times higher than their regional average and present a skew distribution towards the top performers.

- Type B schools includes Schools C, A, and I, where the portion of top performers are more than the poor performers. Their middle group consists of the highest percentage of students, only because of the size of the school. Data show that the group of poor performers remain the minority and thus demonstrate a normalized bell shape performance distribution.

- Type C schools includes Schools E, G and F, which produce a significant number of top performers, but the school management has no control of the number of poor performers, i.e. management allow poor performers to dominate.

- Schools H and B are classified as a mixture of Type B and Type C schools.

The majority of Namibian senior secondary schools could be classified into a school Type C. During 2018, more than 75% of their students were categorized as poor performers. Performance is certainly attributed to resource availability per student. This is explained by the 51 percent correlation between resource availability and national average performance. The remainder 49 percent is explained by school board and school management. The paper suggests that poorly resourced schools cannot produce good performance . For example, student sharing textbooks, compared to well-resourced schools where students do not share textbooks. This can be driven by the fact that poorly resourced schools are disadvantaged to compete with well-resourced schools. These findings are supported by findings from Revutska & Lavrenenko (2013) that educational performances are best developed within dynamic organizational capacity within sufficient resource application.

Further research is called for to determine whether the educational budget and its allocation on either salaries or training resources could improve the educational levels in Namibia.

Conclusion

This paper assessed two decades of student outputs from the Namibian Secondary Education System to determine whether educational development contributed to human capital formation. It is evident from the paper that the change of the educational system took more than 2 decades to gain the consequential outcomes towards the espoused efficiency and educational quality gains.

Specifically, the discussion showed that the implementation of the NSSCH school system resulted into increased number of students but that disparities remains in Omusati, Oshana and Ohangwena regions. The paper calls for further research to determine the drivers of human capital and questions whether the recent adjustment within the syllabus of the senior secondary educational system is justified based on missing cause and effect analysis.

Although access to schools increased significantly, the paper shows that student performances converged into a narrowed envelope. Therefore, this study questions whether the narrowed envelope addresses the quest and needs of the national economy on human capital. Even with historic educational disparities within school outputs, the government's investment in education and their decentralization policy shows some positive results, namely that some schools from rural regions started to catch up with the schools within the functional educational node, the Khomas region. Unfortunately, school resources remain limited and can be regarded as the key factor contributing to prevailing low average performance in the Namibian secondary education.

It can be suggested that the decreasing and low grade 12 performance contributed towards the high unemployment of Namibian Millennials. Time is ripe to unleash the latent capabilities of Namibians to improve productivity through curricula adjustment by equipping the youth to apply the drivers of secondary educational success.

These drivers suggests that a performance system, and a significant improvement of resource availability to enable students to become capable and able to take up jobs. Although the Namibian educational system is well funded it requires regular monitoring of its specific budgetary allocation to allow responsiveness in educational performance to meet national objectives.

References

Altbeker, A. & Storme, E. (2013). Graduate Unemployment in South Africa: A Much Exaggerated Problem. Pretoria: The Centre for Development and Enterprise.

Dashboard. (2012). Charter school race/ethnicity demographics 1. (Nat'l alliance for pub. Charter schools 2012 available at http://www.publiccharters.org/wp-content/uploads/2014/01/napcs-2010-2011-race_ethnicity-details-from-the-dashboard_20120516t152831.pdf

Eaton, S.E. (2001). The other Boston busing story: What's won and lost across the boundary line, Yale University Press, New Haven

Gamede, N.W. (2017). Human capital development in South Africa: Perspectives on Education in the Post-apartheid Era. Unpublished MCom (Economics) University of South Africa, Pretoria.

Herrmann, R. (1985). Statistische Grundlagen der Marktanlayse, Institut fur Agrarpolitik und Marktlehre, Christian Albrecht University, Kiel, Germany

Katjavivi, P.H. (2016). Educational transformation in Namibia, Forum of the Commonwealth Council on Education, London, United Kingdom

De Witte, K. & Lopez-Torres, L. (2017). Efficiency in education: a review of literature and a way forward. *Journal of Operational Research Society* 68 (4) 339-363.

Mayston, D.J. (2013). Measuring and managing educational performance. *Journal of Operational Research Society* 54 (7) 679-691.

Mendelsohn, J. (1997). A review commissioned by the Swedish International Development Agency, Research and information services of Namibia, Windhoek

Nathan, J. (1998). Heat and light in the charter school movement, *Phi Delta Kappan* 79 (7) 499-505.

National Media Holdings. (2017). Newspaper Archive Windhoek, Namibia

Ploom, K. & Haldma, T. (2013). Balanced performance management in the public education system: An empirical study of Estonian general education schools. *Baltic Journal of Management* 8 (2) 183-207.

Revutska, N. & Lavenenko, V. (2013). Formation of enterprise intellectual capital in context of resource theory. *Ekohomika* 9 (150) 71-74.

Sartorius von Bach, H.J. (2018). Two decades of the Namibian Secondary Education results: Formation of human capital from a spatial economics perspective. *Performance Improvement* 57 (10) 47-54.

Shuaibu, M. & Oladayo, P.T. (2016). Determinants of Human Capital Development in Africa: A Panel Data Analysis. *Oeconomia Copernicana* 7 (4) 23-30.

Tikly, I. & Barrett, A.M. (2009). Social justice, capabilities and the quality of education in low income countries, Education working paper no. 18, University of Bristol, UK

Tooley, S. & Guthrie, J. (2017). Budgeting in New Zealand secondary schools in a changing developed financial management environment. *Journal of Accounting & Organizational change* 3 (1).

Viteritti, J.P. (1999). Choosing equality: School choice, the constitution, and civil society, Brookings Institution Press.

World Bank. (2014). National education profile 2014 update, Source for region and income groupings: Education Policy and Data Centre, World Bank, Washington