The Impact of Education Quality on Rates of Return to Education in Namibia

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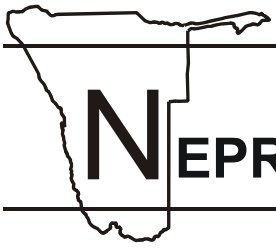

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Disclaimer

The opinions presented are those of the authors and should not be regarded as the views of the Namibian Economic Policy Research Unit (NEPRU), SISERA or IDRC.

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List of abbreviations

CBS	Central Bureau of Statistics
ECP	Education Certificate Primary
EFA	Education for All
GDP	Gross Domestic product
NEPRU	Namibian Economic Policy Research Unit
NPC	National Planning Commission
OLS	Ordinary Least Squares
PSU	Primary Survey Units
PTR	Pupil Teacher Ratio

1. Introduction

Economics offers a variety of theories relating education to economic growth which led to investment in education being regarded as one of the highest priorities by both economists and policy makers. This arises from the proposition that apart from increasing individual's earnings, education promotes economic growth and development and generates various positive externalities. Education is found to both directly and indirectly stimulate capital investment and technological development and adoption. Recent studies (Sianesi and Van Reenen, 2002) seem to indicate that type, quality and efficiency of education matters for economic growth. Based on this proposition many developing countries embraced the idea of prioritising education. The private willingness to invest in education is determined by the perceived or expected earnings from different types and levels of education. Nonetheless, the question remains whether life time earnings vary with the quality of education received. Education quality is understood to be determined by among others better qualified teachers, adequate educational materials, better pupil-teacher ratio (PTR) and better school management. Individual and household characteristics also play a significant role as they affect the education production process.

The definition of quality is problematic and its measurement is also difficult. In the literature two approaches have been common. The first approach is to use scores on standardised national or international tests, when they are available, as measures of education quality (Knight and Sabot 1990, Glewwe 1999, Hanushek and Luke 2001). The second approach is to proxy schooling quality indirectly by the level of school resources (Card and Krueger 1996b, Case and Yogo 1999). Though the debate on the relationship between school resources and student achievements in the United States is not conclusive (Betts 1999), other studies find a strong relationship between school resources and achievements on standardised tests (Card and Kruger 1996a, Lee and Barro 1997, Godana and Ogawa 2003). Controlling for other factors like socio-economic background and school management, school inputs (PTR, teacher qualification or teacher salary, availability of teaching and learning resources) can be good proxy for school outcomes (test scores).

By following mainly the second approach some studies find strong evidence that education quality has a positive impact on life-time earnings (Card and Kruger 1996b, Case and Yogo 1999). Other studies do not find such a strong impact of education quality on life-time earnings (Heckman, Layne-Farrar and Todd, 1995)

Though the importance of quality education is recognised universally, there is very little research in Africa on how the quality of education impacts on the private and social benefit of education. None of the studies surveyed by Appleton (1999) incorporated the quality aspect in the estimation of returns to education.

A proper understanding of the impact of education on individual as well as social welfare is important to determine whether individuals and society are making the right investment choices. Namibia has expanded education opportunities for the vast

majority of the population since its independence in 1990 and has almost achieved universal primary education (close to 95% enrolment rate). Expenditure on education accounts for more than 25% of total government expenditure. There is a growing demand for further expansion of secondary education (currently below 60% enrolment rate) and tertiary education (only 2% of the population has some kind of tertiary education). At the same time, there is concern among policy makers that quality improvement has lagged behind the vast expansion in access to education. Further, quality is not distributed evenly over all schools. The question raised in this study is whether the quality of schooling as proxied by better school resources does matter much in determining future earnings of people. The main objective of this study is to investigate the effect of education quality on rates of return to education. In section 2 the educational history of Namibia before and after independence is described to put the study in a broader perspective of the inequities in the educational system as it relates to the provision and quality of education. In section 3 the theoretical framework for the study is presented and section 4 discusses some methodological issues faced by the study. Section 5 presents selected descriptive statistics and section 6 presents the estimation results using both standard ordinary least squares (OLS) and instrumental variable method estimations. Section 7 concludes with some observations and policy implications and suggestions for future research.

2. Educational history in Namibia

2.1. Pre-independence

Before independence in 1990 schools in Namibia were segregated across racial lines (whites, coloureds and blacks). The official school entering age was set at seven years. However, due to lack of adequate school places access to schools for African children was difficult. This led to African children entering school at a much older age than whites. While education was compulsory for the whites between the age of seven and seventeen, this was not the case for Africans. Furthermore, education was free for whites while Africans had to pay for their children's education either cash or in-kind.

The Bantu[1] education system was designed to achieve the following objectives, namely standard two for literacy, standard six for a better class of labourer, standard eight for training teachers, nurses and police and standard ten for those who are to proceed to universities. Thus, the education system was mainly designed to improve the supply of labour as opposed to the general improvement of the society. In 1980 the cape education system in use in coloured and white schools was introduced in African schools for Matriculation and Junior school certificates. Notwithstanding this introduction, no improvements were made in terms of educational materials, funding and teacher learner ratio.

[1] Bantu education further segregated the education system by introducing separate ethnic based education provision administered by ethnic local administrations.

The majority of African teachers were not trained with about 87% of the teachers in 1976 had no teacher training and no school qualifications beyond Standard 6. Only about 2% of the total number of black teachers had matriculation. Thus, the quality of education provided was different along racial and ethnic lines. Until 1990, education was guided by the policies of the Christian National Education tenet of apartheid, known as Bantu education. This system emphasised an assessment system that focused on selection, failure and rote learning and neglected overall learning. This resulted in the majority of learners progressing slowly and leaving the education system semi or illiterate. Education was provided to Africans just as a means to produce some semi-skilled and skilled artisans who will be able to do those jobs where there are insufficient whites.

Prior to independence, Namibia had eleven semi-autonomous political entities with the responsibility among others of administering education. This gave rise to the establishment of eleven Educational Authorities.[2] As a result education was divided along racial and ethnic lines, thereby leading to extremely skewed and unequal allocation of resources to the different ethnic authorities. The Education Administration Authorities were further divided into Educational districts (divided along ethnic or tribal lines) giving rise to about 26 different education authorities[3].

2.1.1. Educational Policies

Education in Namibia was controlled by a number of acts, such as Proclamation 55 of 1921, which makes education compulsory for white children; Proclamation 16 of 1926, which established a separate education system for Coloureds and Proclamation on Representative Authorities, 1980 (AG.8 of 1980) which authorised the establishment of Educational Authorities. Other Acts included the National Education Act (Act 30 of 1980); Basters of Rehoboth Education Act, 1972 (Act 85 of 1872); Academy Act, 1985 (Act of 1985); and Children's Act, 1960 (Act 33 of 1960). The Proclamation on Representative Authorities delimits the authority of each territory. According to the Act each Representative Authority had the power within its territory to provide education up to standard 10 (grade 12), to train teachers for primary schools and to build and run schools, teacher training colleges and other institutions related to education. Post-secondary education was under the authority of central government.

By 1985 there were about 10,372 teachers of which only about 10.7% were qualified. These figures increased to about 12,525 in 1988 with about 12.3% qualified. Each education administration recruited its own teachers which resulted in major variation in

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[2] Caprivians, Coloureds, Damaras, Hereros, Kavangos, Namas, Rehoboth Basters, Tswanas, Whites, Owambos and The Department of National Education (DNE).

[3] Bethanien, Bushmanland, Caprivi, Damaraland, Gobabis, Grootfontein, Hereroland East, Hereroland West, Kaokoland, Kavango, Keetmanshoop, Karasburg, Karibib, Luderitz, Maltaholhe, Mariental, Namaland, Okahandja, Omaruru, Otjiwarongo, Outjo, Owambo, Rehoboth, Swakopmund, Tsumeb and Windhoek.

the proportion of qualified teachers from one administration to the other ranging from 1% in the Owambo Administration to about 70% in the White administration. The National Education Act allowed for the establishment of National Education Council, which advises central authority on the general education policies and the Examination Board. The Directorate of National Education was responsible for all examinations except the standard 10 (grade 12) which was administered by the Cape Education Department, Republic of South Africa. However, this directorate had no power to impose any educational policy on ethnic education departments.

The distribution of qualified teachers was a direct result of policy decisions since access to teacher training institutions was restricted especially in the northern part of the country. In the early 1980s the three colleges of education in the north were not allowed to offer the Junior Secondary Teaching Certificate because they were considered not to have adequate staff and facilities. They were instead authorised to offer a primary level qualification known as the Education Certificate Primary (ECP) which required standard eight or grade ten for entrance. Due to the lack of qualified teachers ECP graduates were posted to Junior Secondary schools while primary schools were staffed with teachers having lower qualification or no teaching qualifications at all. The following table indicates the percentage of qualified teachers in each Education Administration Authority in 1988. As the table shows there were significant differences in the provision of qualified teachers not only across racial lines but also across black ethnic groups.

Table 1: Percentage of Qualified teachers in Education Administration Authorities

Administration Authority	**1988**
Damaras	**12%**
Couloureds	**16%**
Rehoboth Basters	**11%**
Namas	**9%**
Kavango	**2%**
Caprivi	**2%**
Hereros	**2%**
Wambos	**1%**
Tswanas	**23%**
Department of National Education	**18%**
White Administration	**70%**

2.1.2. Access to Education

In 1976 the Department of Bantu Education report estimated black schools in Namibia to be about 611. By 1980, the total number of schools in Namibia rose to about 965 schools of which 786 were for blacks, 107 for coloureds including Nama and Rehoboth communities, and 72 for the whites. Enrolment rate for the black population was estimated at around 16% (Ellis, 1984). Class size for the African schools was large: estimated to be as high as 70 and 50 learners per class in primary and secondary classes respectively compared to less then 30 learners for both primary and secondary classes for whites. Pupil-teacher ratio was estimated at 37:1, 28:1 and 18:1 for blacks, coloureds and whites respectively.

Secondary and higher education was very restricted to blacks. Until 1953 when the Augustineum College offered the first junior secondary course, no secondary education was available to black Namibians. In the northern regions of the country secondary education began in 1961 mainly offered by the church with few state schools. In 1982 about 261 blacks obtained standard 10 certificate compared to 131 coloureds and 832 whites with only 23 blacks and 7 coloured being admitted to the University compared to 359 whites. Considering the fact that blacks made more than 90% of the population and white less than 5%, the student numbers in secondary and higher education vividly demonstrate the extreme inequality of the apartheid education system.

2.1.3. Educational Resources

In 1982 educational expenditure was about 12% of total budget excluding military expenditures. Notwithstanding the low level of education expenditure especially for Africans, the representative authority was given the responsibility to reallocate resources from education to any other expenditure line items as they deem fit. Furthermore, the Bantu Education system under-funded the northern regions compared to the southern and central regions such that at independence the southern and central regions had better education infra-structures and better qualified teachers. Even after independence, the southern and central regions continue to attract better qualified teachers because they offer better services and opportunities.

Table 2 Resource Allocation, 1977/78, 1982

	Blacks	Coloureds	Whites
Annual Expenditure N$ Million (1977/78)	15.8	6.8	20
No. of pupils	163 638	22 376	22308
Expenditure per head per year N$ (1977/78)	104	221	681
Expenditure per head per year N$ (1982)	232	300	1210
Cost to the pupil per year N$	20-50 (public schools) 80-105 (mission schools)	Free	Free

Sources: Tjitendero (1984) and Ellis (1984)

2.2. Post-independence

Given that pre-independence education in Namibia was characterised by inequality, segregation and other apartheid conditions, upon independence the government introduced a policy of education for all as a constitutional right for all Namibians. Public expenditure on education was increased accounting more than 8% of GDP. Primary education was made free and compulsory for all children of school age (6-16 years). At independence educational reforms were implemented where the many different educational authorities were unified into one. The 26 educational districts were re-aligned into seven educational regions[4]. The educational regions were further re-aligned into the thirteen political regions in 2002[5]. By 1993 a document outlining government's vision for education was published titled "Towards Education for All, A Development Brief for Education, Culture and Training". This document stated five main goals of the education sector – access, equity, quality, democracy and efficiency. By 1998 a new learner-centred curriculum was introduced for all grades (1–12). The educational reform was facilitated through a number of education policies and programmes among others, the constitution of the Republic of Namibia under Article 20, Towards Education for All (1993), and the Report of the Presidential Commission on Education, Culture and Training (1999). Furthermore, educational reforms were facilitated by governments' commitment to achieving the six Dakar goals as well as the Millennium Development Goals. However, it has become increasingly clear that among all these goals as outlined in the Education for All document only the goal of access has been widely achieved. Thus government introduced the Education Act of 2001 promulgated in December 2001 to provide for the establishment of National Advisory

[4] Katima Mulilo, Rundu, Ondangwa East, Ondangwa West, Khorixas, Windhoek and Keetmanshoop

[5] Caprivi, Okavango, Ohangwena, Oshikoto, Omusati, Oshana, Kunene, Erongo, Otjozondjupa, Omaheke, Khomas, Hardap and Karas.

Council on Education, National Examination Assessment and Certification Board, Regional Education Forums, School boards and Education Development Fund in an effort to strive for the achievement of all the EFA goals.

At independence, Namibia had an unequal society with a Gini coefficient estimated at about 0.7[6] with about 75% of the poor living in the rural areas. This inequality was apparent in the education sector where children at one end attend schools with resources equivalent to schools in most advanced countries whereas the other group attend schools with totally inadequate school materials, school facilities and unqualified teachers. Except in the area of building more schools in the disadvantaged regions there has not been any affirmative action to change the inequities in the distribution of teaching materials and qualified teachers. Due to the apartheid experience, Namibia has tried to avoid any measure which could be interpreted as discrimination like affirmative action which is applied even in the US.

2.3. Educational performance, 1990 - 2003

At independence repetition rate for grade 1 was estimated at about 50%. This dramatically declined after independence. By 1997, repetition rate was reduced to 20% in part due to the policy of automatic promotion but also due to improved teaching and learning.

The table below indicates changes in teacher-learner ratio over the years as well as regional disparities during the same period.

The history of education in Namibia illustrates the huge disparity in education opportunities and education quality inherited from colonial times, which still persists 15 years after independence. The enormous progress made in access is not equally matched by improved quality though significant progress has been made in increasing the number of qualified teachers. This is the background for this study which aims at investigating the impact of the disparity in education quality, as measured by school resources, on life-time earnings of people.

[6] The Gini coefficient figure is based on 1993/94 data.

Table 3: Teacher-learner Ratio, 1992, 1995, 2001

Region	Learner- teacher ratio 1992	Learner- teacher ratio 1995	Learner-teacher ratio 2001
Caprivi	25.3	23.7	21.9
Erongo	20.5	23.2	26.1
Hardap	19.4	21.3	24.9
Karas	19.5	20.8	25.4
Kavango	29.9	26.5	28.7
Khomas	20.5	22	26.1
Kunene	23.3	25.4	26.8
Ohangwena	42.3	44.1	36.4
Omaheke	23.9	23.9	25.6
Omusati	34.5	34.1	30.7
Oshana	35.2	35.2	31.2
Oshikoto	37.2	36.4	32.1
Otjozondjupa	23.4	24.5	30.9
Namibia	28.8	29.3	29.2

Source: School Statistics, Education Management Information System, Ministry of Basic Education and Culture

3. Theoretical Framework and Empirical Methods

The study follows the standard Mincerian type of wage function estimation but with the inclusion of education quality measures to determine the additional returns to education due to quality. Quality of education can be influenced either through availability and quality of school resources but also through the socio-economic conditions of the household where the person grew up, usually the parents. Data on school quality together with all the other standard explanatory variables like years of education socio-economic background is used to estimate an earnings (returns to education) function.

$$\log(w_i) = \alpha + rE_i + \beta X_i + \gamma Q_i + u_i$$

Where w is the individual's hourly wages or earnings, E is years of education and X is a vector of other variables (work experience, family background, etc), and Q is school quality variables and u represents other than observed factors.

As the main objective of this study is to determine the impact of quality of education on returns to education than just to years of education, several approaches are tried to see whether different quality measures significantly affect the earnings and education quality relationship. These approaches include:

- Using school resource measures as a proxy for quality (pupil-teacher ratio and teacher qualification)
- Using scores on cognitive test (numeracy test) as indication of the person's ability and family characteristics (parental education, economic wellbeing) as these affect directly or indirectly the learning process.

As the decision on years of education may be determined by individual and household characteristics both ordinary least square and instrumental variable methods are employed to check for endogenity of the schooling decision.

4. Methodological issues

The principal focus of this project is to assess the impact of education quality on economic returns to education. To address the issue of returns to education quality, there was need to undertake an extensive national survey of individuals to collect data on schools attended, socio-economic background, current status of the individual and personal characteristics. Another important piece of information required for the project is the level of different school resources at different points in time. Then the survey data and the school level data will enable to link individuals to the school resources available at the schools they attended. The first stage of the project was therefore, to collect these two essential pieces of information by conducting a national survey and compiling school level/district level data as far back in time as possible.

The primary data was collected through an extensive field survey carried out in all 13 regions in Namibia covering 888 households interviewing 1168 individuals. A questionnaire was designed to collect both qualitative and quantitative data. Furthermore, a cognitive test was administered using a math test developed for Ghana. The survey targeted individuals above the age of 15 years and who are no longer attending school. The questionnaire covered respondent's family background, his/her schooling, employment details as well as income of the respondent in wage and self employment.

4.1. The Survey

A pilot survey was conducted in 5 regions out of thirteen regions in Namibia, which represented almost all language groups. All enumerators participated in the pilot

survey to get first hand experience. In total 85 people were interviewed during the pilot survey, which represents about 7% of the sample size of the main survey (1168).

The sample: The National Planning Commission (NPC) through its Statistical Office (CBS) provided a representative sample of households from their Mainframe. Not only did we obtain a random sample of Primary Survey Units (PSU) but also a list of random sample of households in each of the selected PSUs. This was a great help as it saved us the time consuming process of listing of households in all the selected PSUs to draw the sample from. In addition we were provided with maps of the selected PSUs with indication of the location of the households which were sampled.

A total of 42 PSUs in 13 Regions were selected and in each of the PSUs 24 households were randomly selected giving a total of 1008 households. Since only individuals older than 15 years and not still in school were to be interviewed we expected to interview about 1200 individuals. We have come very close to that (1168 individuals interviewed). 29 out of the 42 PSUs were urban while the rest are rural areas. The survey covered towns, villages and settlement areas with the exception of communal areas involved mainly in subsistence agriculture. Including subsistence agriculture in the survey would have raised difficult and different methodological issues of measurement and estimation of returns to education.

In cases where a household could not be located or moved a replacement household was selected in consultation with CBS. In cases where the individual to be interviewed is not at home during a visit, repeated visits were made until the person was found.

Training by CBS: This was a comprehensive training over a 13 days period. It covered all aspects of household survey from Survey methodology, field operations, questionnaire handling to map interpretation. Thus, our enumerators received solid training which equipped them to handle the complexities of field work.

Specific training by NEPRU: In addition to the 13 days general household survey training our enumerators received additional one day training on some specific questions of our questionnaire. Particularly, the specific training focused on the section dealing with the schooling background of the respondent.

The Questionnaire: The questionnaire was designed after an intensive literature survey. It contained six sections and a total of 121 questions.

Section1: Respondent's biographical details

Section 2: Respondent's family background

Section3: Schooling of respondent

Section 4: Respondents employment details

Section 5: Income details for respondent in wage employment

Section 6: Income details for respondent in self employment

The Math Test: During the survey in addition to the main questionnaire a math test was also administered. The test is an abridged version of a test conducted by World Bank Teams in 1988 and 2003. The test consisted of 18 multiple choice questions. To our great delight an overwhelming majority of respondents enthusiastically took the test.

A literacy test was considered but due to language problems it was dropped. It would have required the setting of the test in more than 7 languages. The cost of employing language specialists to construct/translate the test into 7 languages was considered prohibitive.

The table below presents details of the main survey.

Table 4: The Survey

Region	Enumerators	Days	Households	Individuals
Caprivi	1	28	62	99
Erongo	3	10	79	104
Hardap	3	9	88	115
Karas	3	5	43	60
Kavango	2	40	71	91
Khomas	7	63	127	161
Kunene	4	7	64	85
Ohangwena	2	11	40	44
Omaheke	4	8	62	84
Omusati	2	9	43	54
Oshana	2	16	64	80
Oshikoto	2	15	63	84
Otjozondjupa	4	7	82	107
Total	12	228	888	1168

School quality data

In this study school quality is proxied by the provision of teachers as measured by pupil-teacher ratio and the quality of teachers measured by the percentage of qualified teachers in the school. Arguably, this one dimensional measure of school input (teachers) does not fully capture or measure the quality of schools. Other inputs like learning and teaching materials, availability of facilities like libraries and laboratories, availability of adequate school management, motivation and commitment of teachers and even the education curricula are important dimensions which in a very complex way impact on quality of a school. It has not been possible to assemble such information over a long period of time and therefore the study confines itself to a much narrower definition of school inputs. One has to bear in mind this limitation in interpreting the results of the study as it only tells a small part of a much bigger story.

Data 1989 to 2002: Data on school inputs like Pupil Teacher Ratio and qualification of teachers have been compiled for about 1500 schools for years 1989, 1992, 1996, 1998 and 2002. The raw data was constructed from information provided by the Ministry of Basic Education, Sport and Culture. However, the access to a pre-independence school level data has proved very difficult.

Data before 1989: For the pre-independence period we were only able to obtain school data at district level (35 districts) for the years 1984, 1986 and 1989 and for people who attended school before 1984 the school quality data in 1984 was used as school data older than that could not be obtained. This is quite adequate as availability of school resources did only change significantly after independence in 1990.

Since school quality changes over time and individuals may have attended different schools of varying quality, it was necessary to collect data on which schools a person actually attended and for how long. As for quality variables two types of school inputs were considered. First the pupil-teacher ratio and second the percentage of qualified teachers in the school. For each school the average quality during the time the child attended the school is calculated. In the data very few people attended more than two schools during their schooling. The study attempts to capture not only quality differences across schools but also changes in school quality over time within a school.

5. Descriptive Statistics

The variables used in the estimation in the next section are defined below and descriptive statistics is given in the table.

AGE	Respondents age
EDUC	Respondent’s completed education in years
EXPER	Respondents experience computed as the difference between the respondent’s age and the age at which the respondent left school

EXPSQ The square of respondent's experience

FATHEDU Respondent's father education in years

MOTHEDU Respondent's mother education in years

HHASSET Household asset (In the questionnaire there were 20 questions concerning the household situation in which the respondent grew up including household consumption (food, clothing, medical care), household assets (ownership of land, cattle, house, business, motor vehicle, etc.) and household infrastructure (type of dwelling, source of water, type of ablution facilities). Since the household assets variable is strongly correlated with both household consumption and household infrastructure we have used household assets in the estimation to avoid correlation between explanatory variables.

PTR1, PTR2, PTR3 Average pupil-teacher ratio in the first, second and third school the respondent attended respectively. Only a third of the relevant group (those for which wage data were recorded) have attended more than two schools. In most estimation the resource in the first school attended is used because of more observation and also perhaps the first school is crucial in laying the ground for the individual.

Q1, Q2, Q3 Average percentage of teachers with qualification in the first, second and third school the respondent attended respectively.

WAGEHR Hourly wage of respondent (the natural log of hourly wage is used in the estimation)

TOTRESULT The number of correct answers on a math test containing 18 questions.

Table 5: Descriptive Statistics

	AGE	EDUC	EXPER	FATHEDU	HHASSET	HOURSMAIN	MOTHEDU
Mean	35.89	10.52	16,64	2.66	3.51	46.88	2.22
Median	34.00	10.00	14.00	2.00	3.00	45.00	2.00
Std. Dev.	9.97	3.58	11	1.51	2.26	21.31	1.24
Observations	508	510	472	510	510	510	510

	PTR1	PTR2	PTR3	Q1	Q2	Q3	WAGEHR	TOTRESULT
Mean	31	35	44	13.28	19.31	20.67	15,55	4.53
Median	28	27	40	12.00	18.00	22.00	7.75	5.00
Std. Dev.	9.68	19.34	24.91	12.33	15.41	12.80	27	3.78
Observations	423	319	176	425	331	183	506	510

Out of a total of 1168 individuals over the age of 15 interviewed wage information was obtained for 510 individuals. Most of the interviewed had no job and therefore no work related income. The average age of the respondents is about 36 years and half of them are below 34 years of age. It is also evident that the average education of the population has increased dramatically between the generations, parents having only 2 years of education compared to 10 years of education for their children. There is very little difference between mothers' and fathers' education. Half of the respondents had 14 or more years of experience. The performance on the numeracy test is quite low, half of them scoring 5 or lower out of 18 questions. Half of the respondent earned less than N$8 per hour (about US$50 a week).

6. The estimation

6.1. Standard OLS estimation

Below we report estimation results common to many returns to education estimations.

Table 6 OLS results

Variables	OLS 1	OLS2	OLS 3	OLS 4
Constant	-1.34 (-6,46)	-1,67 (-5,64)	-1,57 (-4,13)	-1,54 (-4,05)
Years of education	0,28 -17,11	0,28 -16,64	0,28 -16,22	0,24 -11,84
Experience	0,034 -8,43	0,07 -4,87	0,07 -4,69	0,07 -4,81
Squared experience	0,00004 -8,31	-0,0007 (-2,08)	-0,0007 (-2,01)	-0,001 (-1,98)
Father's education				-0,05* (-1,41)
Mother's education				0,1 -2,24
PTR1		-0,0009* (-0,86)	-0,002* (-0,38)	-0,006* (-1,03)
Q1			-0,002* (-0,41)	-0,004* (-0,83)
Household asset				0,05 -2,1
Pre-primary attendance				0,28 -2,67
Result on test				0,04 -2,73
Adjusted R-squared	0,38	0,41	0,41	0,44
F statistics	98,96	73	58,33	33,82

Number of observations	476	421	421	421

t statistics in brackets, * not statistically significant at 5% significance level

All the four models have high explanatory power (high adjusted R-square and F-statistics) which is not common in cross section data. All the standard variables (education, experience and its square) have the expected signs and statistically highly significant in all four models except experience squared variable which has a positive sign in OLS 1. The rate of return to education is high and quite stable across the four estimations.

OLS 2 and OLS 3 include school quality variables as measured by school inputs (pupil-teacher ratio and teacher qualification). Pupil-teacher ratio has a negative impact on returns to education implying the higher the ratio the lower the quality of schooling and ultimately affecting market returns to education. Teacher qualification has however the unexpected negative sign. This is perhaps the negative correlation between pupil teacher ratio and teacher qualification observed in the data (correlation coefficient of -0,47). Estimation using pupil teacher ratio in the last school attended by respondents did yield a statistically significant results but the magnitude remained very small. In all cases the effects are either statistically insignificant and/or very small in magnitude implying school resources (teachers and their qualification) available during schooling years have very little effect on future wages.

This conclusion though sounding counter-intuitive has support from other empirical work. Betts (1999) cites some such findings which indicate “little impact of school resources on students’ later earnings”. Betts goes even further in terms of the policy implications when he says that “a closely related policy question concerns whether to spend on additional years of schooling for young people, or to increase the quality of education, for a given level of schooling, by increasing spending per pupil. The extensive American literature suggests that the former policy has a much higher payoff than the latter”. If the impact of the pupil-teacher ratio and teacher qualification on future earning is through the impact of these inputs on learning and student performance, the absence of strong relationship between school inputs and student performance would imply no impact of these inputs on future earnings. Hanushek (1995) reviewed 100 studies in developing countries and reached the conclusion that there is “little evidence that the teacher-pupil ratio or teacher salaries (proxy for teacher qualification) positively and significantly related to student performance. Godana and Ogawa also find that “the pupil-teacher ratio seems to have very little impact on student performance” The same study finds however that teacher qualification has a positive and significant effect on student performance. The education production function estimated by Godana and Ogawa is presented in the following table. The dependent variable is the average mark for grade 10 examination for four subjects (English, math, physical science and life science) for the academic year of 2002. The estimation clearly show that school resources widely defined to include various types of inputs do impact on student performance, at least for the year recent data is available.

Table 7: Estimates of education production function

	Average of 4 subjects
Constant	-3.80
	(-0.762)
Book per learner	1.31*
	(5.70)
Pupil Teacher Ratio	0.11
	(1.5)
Average qualification	6.08*
	(6.47)
Laboratory	2.25*
	(2.69)
Experience*Qualification	0.10*
	(4.25)
Combined school (schools with both primary and secondary levels)	3.29*
	(2.89)
Adjusted R squared	0.35
F Value	38.05
No. of observations	413

t-values in brackets, * significant at 5%

Such an estimation of education production function was not possible in this study as we lack information on the school performance of respondents. To see if school resources matter for the performance of respondents on the math test we regressed the test score against school resources and some family household characteristics. Not surprisingly years of education is the most important determinant of test scores. School resources as measured by the pupil teacher ratio is neither statistically significant nor significant in magnitude. However, household characteristics (mother's education and household assets) where the child grew up have significant effect on the test score.

This is a strong indication that out of school factors have important role in determining the quality of education a child receives during his or her schooling years.

Table 8: Estimate of impact of PTR on test scores

Dependent Variable: TOTRESULT Included observations: 421 after adjustments			
Variable	Coefficient	Std. Error	t-Statistic
C	-1.086118	0.782358	-1.388262
EDUC	0.612889	0.049818	12.30249
PTR1	-0.010394	0.017196	-0.604421
Adjusted R-squared	0.27		
F-statistic	77.32		

Table 9: Estimate of impact of household characteristics on test score

Dependent Variable: TOTRESULT Included observations: 510			
Variable	Coefficient	Std. Error	t-Statistic
C	-0.415287	0.560984	-0.740282
EDUC	0.225796	0.043009	5.250021
HHASSET	0.468413	0.069298	6.759413
MOTHEDU	0.418008	0.125436	3.332430
Adjusted R-squared	0.17		
F-statistic	35.18		

As it is well recognised education quality does not depend just only on school inputs but also on individual and home characteristics like the education of parents, the wellbeing of the child while growing up (availability of food, medical care, better dwelling, etc) and also the innate ability of the child. To take into account these individual and home

characteristics education of the parents, household assets, whether the child attended pre-primary education and the performance on the cognitive test are added as explanatory variables in model OLS 4. It appears that individual and home characteristics have very strong effect on future earnings which are significant both statistically and in magnitude. Especially, household assets, mother education and attendance of pre-primary education have the strongest effect. Fathers education has negative coefficient but statistically not significant. This again confirms findings by other studies about the importance of mother's education for children's upbringing and success.

6.2. Labour market imperfections

In a society which was characterised until very recently by extreme racial segregation and inequity, labour market outcomes may not reflect labour productivity as assumed in a return to education estimations. The fact that education quality seems not to have any significant impact on returns to education may be the result of a variety of labour market imperfections. As the following table shows, labour market imperfections are extremely severe in Namibia. Blacks earn less than coloureds and whites earn more than coloureds with the same level of education. The gender bias is also strong with men earning higher than women. The urban and rural divide is also significant, urban labour having a higher return on education than rural labour. Last but not least unionised labour receives better return than non-unionised labour. With all these market imperfections it is not perhaps surprising that the effect of the quality of education on returns to education did not come out clearly.

Table 10: Estimates of labour market imperfections

Dependent Variable: LNWHR Included observations: 447 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.262893	0.325978	0.806475	0.4204
EDUC	0.204964	0.015513	13.21202	0.0000
EXPER	0.007629	0.004281	1.782151	0.0754
EXPSQ	7.24E-07	1.08E-06	0.668733	0.5040
SEX	0.228506	0.094631	2.414710	0.0162
UNION	0.463623	0.098104	4.725827	0.0000
URBRUR	0.395713	0.113863	3.475335	0.0006
BLACK	-1.079330	0.228794	-4.717479	0.0000
COLOUR	-0.729515	0.282035	-2.586607	0.0100
Adjusted R-squared	0.375054			
F-statistic	34.45777			

6.3. Instrumental variable method estimation

The OLS estimation above assumes that the explanatory variables are not correlated with the disturbance term which in many cases may not be appropriate. This especially relates to the schooling decision which might be affected by variables which are considered to be part of the disturbance term in the estimation. That is to say years of education and its quality may not be entirely exogenous and therefore the estimates from OLS can be biased (the direction of which is not known).

The endogenity of schooling decisions can be addressed by using instrumental variables estimation methods. The instruments considered include household-level characteristics (the characteristics of the household in which the person grew up). These include household consumption, household assets and household infrastructure. Since household assets are strongly correlated with both household consumption (correlation 0,35) and household infrastructure (correlation 0,17) only household assets are included in the estimation. Another household characteristic which might affect

schooling decision and also schooling quality is parent's education. Parent's education, in addition to determining household income, determines attitude to ones children's education but also affect the quality of children's education. Educated parents assist their children in their homework and very likely reading materials will be available at home. Therefore, household and individual characteristics are used as instruments than as explanatory variables unrelated to the education decision. The instruments to be used sequentially and simultaneously are mother's education, household assets and scores on test results. A simple test of the appropriateness of the instruments is the correlation between the residual of the OLS estimate and the instruments. It is a requirement that the residual is not correlated with the instruments. Indeed the correlation between the residual and the instruments mother's education, household asset and test results are very low (0.04, 0.11, and 0.09 respectively). Therefore, we consider the three instruments selected to be appropriate. The results of the instrumental variable method are reported in the following table.

Table 11: Instrumental Variable estimation

Variables	IV 1	IV 2	IV 3
Constant	-3,81	-2,85	-2,96
	(-4,33)	(-5,84)	(-6,23)
Years of education	0,45	0,38	0,39
	-6,7	-10,77	-11,4
Experience	0,09	0,08	0,08
	-4,98	-5,15	-5,17
Experience squared	-0,0006*	-0,0006	-0,0006*
	(-1,51)	(-1,8)	(-1,77)
PTR1	0,003*	0,001*	0,001*
	-0,54	-0,25	-0,29
Adjusted R-squared	0,26	0,36	0,35
F statistics	14,26	32,53	35,94
Number of observations	421	421	421
Instruments	Household assets	Test result	Household assets
	Mother's education	Mother's education	Test result
			Mother's education

t statistics in brackets * not significant at 5% level of significance

The return to education increases in the instrumental variable method by almost 40% compared to the OLS from an average of 27% to an average of 41%. Maluccio (1998) finds an increase of 50% over the OLS estimate. The bias due to the neglect of the endogeneity of education decision is indeed very high. This is because now years of education also reflect the quality aspect as influenced by individual and home characteristics.

7. Conclusion

This study has investigated the relationship of rates of returns to education and school quality. Based on an extensive survey of households and a record of school resources

for almost 20 years it has matched individuals to the schools they have attended during their schooling years. Quality changes across schools and also for individual schools over time were considered. In agreement with many other studies for different countries school resources as measured by pupil-teacher ratio and teacher qualification were found to have very little impact on rate of returns to education. This does not however imply that education quality is not important but that school resources are inadequate measure of quality of education received by an individual. School resources are necessary but not sufficient to significantly affect education quality because other factors at the school level like management, teacher effort and competency (not formal qualification), teacher and student motivation as well as the teaching and learning process may have more impact. The research also found significant distortions and imperfections in the labour market which perhaps overshadow the impact of education quality on returns to education. The returns to education are much higher for whites and coloureds than for blacks, men have higher returns than women, living in urban areas raises the return compared to rural residence and unionised labour has higher returns than those who do not belong to a union.

This study gives strong evidence that factors like mother's education, household assets, attendance of pre-primary education as well as cognitive ability of the individual have strong and positive impact on earnings.

The policy implications of this analysis are:

1. Improving and equitably distributing school resources may not be adequate to achieve equitable outcome of education in terms of earning capacity. Therefore, measures which improve household equity or/and additional measures that compensate for household inequity (school-feeding programmes, provision of education materials, improved dwelling, medical care, water and sanitation, etc) are necessary to attain equity in education outcome.

2. The fact that attendance of pre-primary has such a strong impact on individual future earnings lends support to current education policy discussion in Namibia regarding the expansion of pre-primary education in a pro-poor manner.

3. The study also suggests a much deeper analysis of education quality at the school level than the mere recording of school resources and the relative effectiveness of different inputs as to their impact on learning and ultimately on future earning potential.

4. Last but not least the study revealed significant labour market imperfection which might have overshadowed any positive effect school resources might have had on the quality of education and ultimately on future earnings. This indicates the need for policy designed to reduce labour market distortions which militate against the acquisition of better education and skills.

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