

LOW QUALITY EDUCATION as a poverty trap

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Servaas van der Berg

Cobus Burger

Ronelle Burger

Mia de Vos

Gideon du Rand

Martin Gustafsson

Eldridge Moses

Debra Shepherd

Nicholas Spaul

Stephen Taylor

Hendrik van Broekhuizen

Dieter von Fintel



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THIS RESEARCH PROJECT

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Programme to Support Pro-Poor Policy Development
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A Tale of Two South Africas

South African society is marked by a stark inequality in incomes. Despite efforts to transform the structure of the economy, the divide between those with little and those with plenty has retained a racial dimension. The persistence of these patterns of income distribution has been blamed on the overlap between race, language, culture, education level and neighbourhood. Mogues and Carter (2005), for instance, argue that when the rich and poor are also distinguished in terms of culture, race or language, economic marginalisation could be enduring or perhaps even worsen over time. They refer to the insider-outsider dynamic forged by these overlapping divides as 'socially embedded' exclusion.

The research that this document reports on considers how the low quality of tuition offered in schools in poor communities can entrench exclusion and marginalisation. Within this system of overlapping divides, most of these categories cannot be transcended easily. Race is a social construct but a sticky one, while language and culture are, to a large extent, also social identities into which you are born. Moving to a more affluent neighbourhood is not a reliable strategy to escape poverty, as it tends to be the consequence of social mobility rather than the cause of it. This leaves education as the only viable avenue for poor people who want to enter the top end of the labour market, with all its attendant economic benefits. Education therefore has a significant role to play both in providing opportunities to individuals as well as through its potential to unravel the apartheid-era social structure and create a more cohesive and less polarised society.

Thus, while there is much scope for education to challenge and transform individual lives and social structures, at least in principle, this study demonstrates why we are seeing so little evidence of this. Our research shows that by the age of eight there are already very large gaps in the performance of school children in the top 20% of the population (top quintile) versus those in the bottom 80% (bottom four quintiles). In other words, by an early age there are already stark distinctions between the prospects of children from poorer communities and those from more affluent communities.

According to our research, the education system generally produces outcomes that reinforce current patterns of poverty and privilege instead of challenging them. Unsurprisingly, we find that the inequalities in schooling outcomes manifest via labour market outcomes, perpetuating current patterns of income inequality.

This document is an examination of the education system and the labour market based on our research. It is an

attempt to understand the dynamics responsible for the creation and perpetuation of the great South African divide between rich and poor, and to suggest a way forward.

Pro-poor reforms to the education system appear largely ineffective

At the time of the transition to democracy, a South African education system was envisaged that would foster nation-building, promote democratic values and provide a pathway out of poverty for the poor. Fundamental reforms to the administration, governance and funding of education were required. A unified national department of education was established with considerable responsibility vested at the provincial level. Controversial curriculum reform, now widely believed to have been an impediment to progress, represented a strong break from previous arrangements and sought to advance inclusive education.

Public spending on education was highly unequal on the basis of race in the heyday of apartheid. Reforms to spending began prior to 1994 and public spending has since become increasingly well-targeted to poor children.

In 2006, 49% of education spending reached the poorest 40% of households (Van der Berg, 2009). Personnel spending represents 80% of the overall education budget. This limits the extent to which education spending can be redistributive, as teacher salaries are based on qualifications and experience, and better qualified and more experienced teachers often prefer to teach in more affluent schools.

The National Norms and Standards for School Funding introduced in 2000 and amended in 2006 aimed to target a greater share of non-personnel expenditure to poor schools. Since 2006 the poorest two quintiles of schools have been classified as "no-fee schools" and this was later extended to include the third quintile. These schools do not charge fees but receive more non-personnel funding to compensate for this loss of income.

Non-personnel spending is well-targeted: Public spending on the poorest fifth of schools is roughly six times higher than spending on the richest fifth of schools. Although non-personnel funding received by schools is pro-poor, schools in more affluent communities remain better resourced due to the practice of charging school fees.

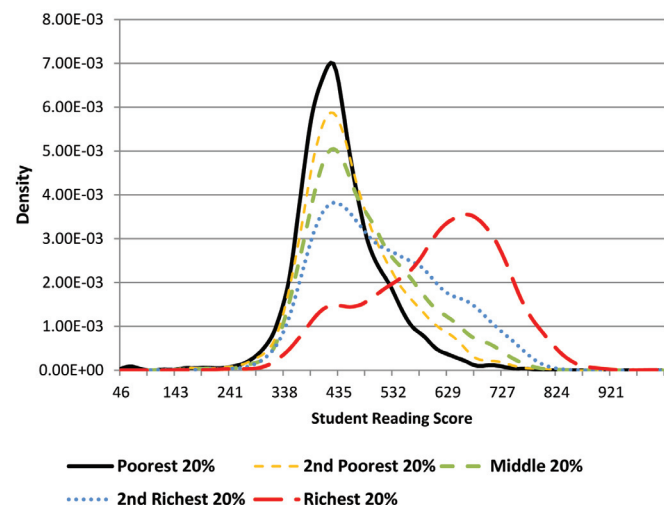
Despite these reforms, education quality has remained disappointing. Surveys indicate that the level of cognitive achievement of the majority of South African children is alarmingly low in key learning areas such as Reading, Mathematics and Science. The Systemic Evaluations undertaken by the Department of Education show that the majority of children are performing well below the

standards required by the curriculum. In the Trends in International Mathematics and Science Study (TIMSS) of 2002, South African Grade 8 students achieved the lowest average scores in both Mathematics and Science out of 46 countries, including six African countries. More recently and at the primary school level, South Africa came last out of 40 countries in the Progress in International Reading Literacy Study (PIRLS 2006). The PIRLS sample included some developing countries, but was admittedly biased towards developed countries. Therefore the Southern and Eastern African Consortium for Monitoring Education Quality surveys of 2000 and 2007 (SACMEQ II and III) may provide a more meaningful comparison. Here, South Africa performed slightly below the average of the other participating African countries in Grade 6 Mathematics and Reading, despite benefiting from better access to resources, more qualified teachers and lower pupil-to-teacher ratios.

Not only is the cognitive performance of South African children disturbingly low, it is also highly unequal. According to SACMEQ III, the average Reading test score for the richest 20% of learners in Grade 6 was 605, compared to 436 for the poorest 20% of learners (the mean across the international sample was set at 500 and the standard deviation at 100). This disparity was repeated in the Mathematics test, although the difference was slightly smaller with averages of 583 and 454 respectively. South Africa's rural children did far worse than rural children in most other countries in this African sample, as did the poorest quarter of South African students in comparison with the other countries in the sample. When ranked by

the performance of the poorest 25% of students, South Africa comes 14th out of 15 Sub-Saharan countries for reading, and 12th for maths. Rural South African children also fare poorly relative to their peers in African countries: rural South African students came 13th in reading and 12th in mathematics out of the 15 African countries. Thus, when seen in regional context, South Africa grossly under-performs given that it has more qualified teachers, lower pupil-to-teacher-ratios and better access to resources (Spaull, 2011).

Figure 1: Grade 6 reading test score distribution for various socio-economic groups, 2007



Source: Own analysis using SACMEQ III

Figure 1 shows the distribution of test scores across socio-economic groups. The distributions depict the proportion of learners from a specific socio-economic group (along the vertical axis) that achieved specific Reading scores

BOX 1

South African educational attainment in a global context

Over the last several decades, the rate of enrolment and the average years of education attained by South African individuals have been rising steadily. Moreover, the interracial attainment gaps have narrowed substantially in this period. Consequently, South Africa now fares relatively well by international comparison in terms of educational attainment, at least up until grade 11. The rate of completion of grade 12 is, however, rather low by international comparison. Increasing the rate of grade 12 completion from about 40% to 50% would put South Africa on a par with Thailand, for example. Further increases may, in fact, not be desirable, especially if this would involve lowering the standard of the Matric examination. Even in developed countries the

secondary school completion rate generally does not approach 100%. For the United States, the United Kingdom and Japan the secondary school completion rates are 77%, 87% and 93% respectively.

Enrolment in post-school institutions is particularly low in South Africa. Less than 10% of South Africans attain at least 15 years of education (the amount required for a three-year university degree), which is roughly 30 percentage points below the norm for middle-income countries. This amounts to a shortfall of about 300 000 students, which could account for the much-discussed skills shortages in the labour market.

One should be careful in interpreting these attainment trends. The pattern of high attainment up until grade 11

and low attainment of post-school education could be taken at face value to imply that the problems in South African education apply mainly at higher levels of education. In contrast, a more probable explanation is as follows: Low-quality education combined with high and lenient grade progression up until grade 11 means when a standardized assessment occurs, i.e. the Matric examination, this serves to filter a large proportion of weak students out of further attainment. Many of those who do attain a Matric Certificate are still not able to gain entrance into tertiary institutions. Therefore, low-quality education up until grade 11 can be regarded as the root cause of low attainment beyond grade 11.

(along the horizontal axis). Each distribution represents one fifth of learners, ranked according to their socio-economic status. It is striking that only the most affluent learners (the top 20%, here depicted with a red line) generally performed above the average score of 512 (for the African countries in the SACMEQ sample).

The legacy of apartheid appears to have endured. The former racially separate education departments therefore remain important categories for analysis. Not only have the large performance gaps between former black schools and former white schools prevailed, but also the relationship between former education department classification and socio-economic status. This double burden of historical disadvantage and current poverty may help to explain why South African learners perform worse than African learners facing similar levels of economic deprivation.

Why do schools in poor communities underperform?

The patterns outlined above point to enduring problems with the quality of schooling provided in poor communities. This, in turn, constrains the ability of the education system to provide a pathway out of poverty for poor children. Our analysis of school surveys indicates that residents of poor and predominantly black neighbourhoods frequently attend schools with a lack of discipline, weak management and few highly qualified and experienced teachers. This relationship between poverty and low-quality tuition is reinforced through several social mechanisms, including the influence of parents, the influence of the child's peers and a broader neighbourhood effect.

The influence of poor schools and poor communities is difficult to disentangle statistically. Because children predominantly attend a school close to their home due to distance and transport costs, there is often an overlap between the school's socio-economic profile and that of the community where the child resides. However this is less true in metropolitan regions, where children are more mobile.

An analysis of SACMEQ III (Spaull, 2011) shows that the effects of the community and the combined socio-economic status of schools are more pronounced than the individual-level effect of socio-economic status. In other words, the individual child's socio-economic background matters less for her performance than the area she lives in and the school she attends. Our analyses of other educational datasets support this finding (Shepherd, 2011; Taylor, 2011).

Number of teachers and teacher quality

Teacher quality, and specifically teacher knowledge, has often been thought to play a crucial role in learner performance. SACMEQ III provided the first dataset that allows testing this hypothesis. Our analysis of this data

does, however, suggest that teacher knowledge is no magic bullet.

Firstly, the results indicate that insufficient teacher knowledge is a problem. The teacher tests were comparable to those taken by the learners and, accordingly, were relatively basic. One would expect most teachers to score close to full marks. Unfortunately, this was not the case. The average teacher scores in both Reading and Mathematics tests were well below that.

While teacher knowledge was lower in poor schools than in richer schools, it made little difference to learner performance. After accounting for other factors affecting learner scores, a 100 point improvement in average teacher Reading scores was only accompanied by an average 7 point increase in learner scores, i.e. 7% of a standard deviation across all SACMEQ countries. For Mathematics, a 100 point increase in teacher scores was associated with an even smaller average change of 4.8 points.

This does not imply that teacher quality is unimportant. There are at least two more plausible explanations: Firstly, the dimensions of teacher quality that matter may not be captured by teacher knowledge. It may, for instance, be that the ability to teach students well at a Grade 6 level is more dependent on the teacher's ability to convey knowledge or the teacher's motivation and dedication than on his or her subject knowledge. Secondly, many schools may be facing other bigger constraints that prevent teacher knowledge from having its full potential impact on student learning. This seems plausible because the impact of teacher knowledge on Reading scores is much smaller for the poorer four-fifths of schools, and for the Mathematics scores of these schools we see no significant effect.

Textbooks

Previous studies have shown that providing access to textbooks delivers significant returns in terms of educational outcomes. This is confirmed by the recent analysis. In the SACMEQ study, when learners had their own Reading textbook, or when they shared it with no more than one other person, they tended to perform better. The same effect, however, was not seen for Mathematics textbooks. Among the poorest 20% of learners, 37% either did not have a Reading textbook at all, or had to share the book with two or more other children. Only 15% of the richest learners were in a similar position.

Classroom practices

Many classroom practices are correlated with performance, such as the frequency of giving homework, whether assessment records were up-to-date, and the extent of curriculum coverage. However, such correlations do not necessarily imply causation, i.e. that these classroom practices improve performance. Things may also work the

other way around, for instance teachers may slow down and not cover the full curriculum because their class could not keep up, or these practices may simply reflect a more important factor, viz. a well-organised and motivated teaching staff.

Having said this, curriculum coverage and the frequency with which Mathematics and literacy exercises are undertaken by students are at such low levels in many of South Africa's schools, that the promotion of such activities in these schools would certainly be advisable.

Discipline and management

Our analysis indicates that school discipline and effective management make a large difference to performance. Important factors include the presence of curriculum planning for a full year, a functional timetable, teaching support materials (LTSM), good quality inventories for learning and low teacher absenteeism. Again, we do not interpret such correlations as evidence of a causal effect, i.e. that improved curriculum planning will improve school performance, but rather to indicate that more attention should be given to management and oversight (See Box 2 on this page).

Assessment and feedback

A lack of feedback to learners and parents also appears to hinder the progress of learners in poor schools.

A simulation exercise using National Senior Certificate (Matric) data from 2009 revealed that a number of students who failed Matric probably would have passed if they had taken different subject combinations. It was estimated that the Matric pass rate could have been 15 percentage points higher, had students switched from certain non-language subjects to other non-language subjects. In particular, the switch from Mathematics to Mathematical Literacy would have led to a large number of Matric passes.

The benefits from subject switches were estimated to be greatest within the poorest quintile of schools, where unreliable assessment practices have been shown to be most severe. To suggest that students from poor backgrounds should take Mathematical Literacy rather than Mathematics is, of course, contentious. The point is rather that some students would indeed have been better advised to take Mathematical Literacy, while, conversely, other students perhaps should have taken Mathematics. In both cases, inappropriate subject choice may stem from inaccurate feedback about their Mathematics ability. This provides further support for the argument that poor feedback may be part of the problem with the schooling system.

The correlation between individual marks attained in the school-based continuous assessment in Matric and those obtained in the externally assessed Matric exam was unusually low in poor schools, on average below 0.60 when calculated across all subjects (Van der Berg & Shepherd, 2010). If annual assessments at lower grades show similarly inaccuracy, it would mean that more than half of the students who failed would have done better than many of those who passed, whereas many passed who would have been better candidates to repeat a grade.

This is in line with previous research in this area by Lam, Ardington and Leibbrandt (forthcoming) which indicates that inaccurate feedback could affect grade progression as well as decisions on whether to persevere at school. Standardised assessments can improve this aspect of school quality by giving students and parents more accurate feedback and by providing teachers with information on the standards required at a particular grade. Greater familiarity with such standards may enhance the ability of parents to act as monitors for school quality and as

BOX 2

Interpreting indicators of school management

School management indicators should be interpreted and treated with caution as these variables are often symptoms of certain management practices rather than the cause of those practices. For instance, we find that timetables are a good indicator of school management, but may not be a good focal point for policy interventions. The existence of functional timetables is associated with effective school management, but the patterns of causation are complex and run in both directions. Timetables may improve school management, but it is equally likely

that the presence of timetables is indicating which schools are already functioning well, and doing so not necessarily because of those timetables. Consequently, ensuring that schools have timetables is unlikely to solve the problem of poor school management.

In general, a checklist approach of effective management practices may empty such practices of their value and may motivate schools to go through the motions and divert attention from the central task of teaching.

A more fruitful strategy may be to encourage and support school leaders and teachers through professional development and rewarding good performance. However, it is important to note that such extrinsic forms of motivation have their limitations. Extrinsic motivation has been shown to crowd out intrinsic motivation. If the focus is shifted to intrinsic motivation, this would require a renewed focus on recruitment and hiring practices and in particular, the selection and appointment of school principals.

champions for their children's education.

Additionally, the analysis of PIRLS by Shepherd (2011) suggests that more parental involvement does not yield any significant school level benefit in African language schools, while there are discernable benefits to parental involvement in English and Afrikaans language schools. This may in part relate to anecdotal and case study evidence implying that the poor are often underrepresented in School Governing Bodies and, if present, are less vocal.

Home background (parental and community influences)

It is universally recognised that family and other environmental factors contribute greatly to the development of cognitive skills and subsequent labour market outcomes. Although a matter of debate in the literature, much of the international research suggests that these family background effects may outweigh those of the school – but these factors are less amenable to policy.

There is evidence in international literature that poorer children enter school with a cognitive disadvantage because they lack access to the kind of resources and stimulation well-off children enjoy. One response to this socio-economic gap in performance is to create mechanisms that enable the school system to play a role from an earlier age in the attempt to overcome the early deficits that some children face.

There has been much South African research interest in this topic and also some policy activity. The Education White Paper No.5 of 2001 set the enrolment of all five-year-olds in a pre-school educational institution by 2010 as an important goal. Although this target has not been achieved yet, our research provides evidence that enrolment numbers have been steadily increasing (see the Box 3 on p.9).

The enduring legacy of apartheid-era departments

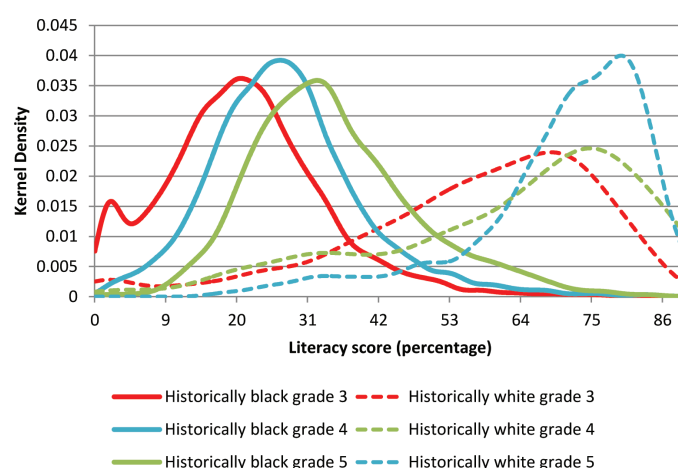
Figure 2 illustrates the differences in learning and improvement achieved in a year of schooling in two different segments of the South African schooling system. Those parts of the school system that were designated as schools for black learners under apartheid are still underperforming. Given that these represent the majority of our schools, this is of grave concern.

The figure shows the distributions of literacy achievement for the same group of students across three years. The graphs were constructed to contrast the improvement in performance between grades by historically black (ex-DET) schools versus historically white (ex-HOA) schools. The distributions depict the proportion of the sample (along the vertical axis) that achieved specific literacy scores (along the horizontal axis). A shift of the distribution to the right signifies an overall improvement in results. To distinguish the two groups of learners, the distributions of literacy

scores for the historically black schools across the three years are represented using solid lines and the distributions of literacy scores for historically white schools using broken lines. It is worrying to see how far most children in historically black schools have already fallen behind their peers in historically white schools by the fifth grade, and that they in fact still performed far worse than the latter did in Grade 3. This provides further evidence that the legacy of the apartheid-era system has endured and is still entrenching patterns of privilege and deprivation.

In light of these findings, it is unsurprising that Taylor and Yu (2009) found that African language learners who were enrolled in the historically privileged part of the school system performed substantially better in reading than African language learners of the same socio-economic background who were enrolled in historically black schools. The same result was found in this research, implying that these children may be able to achieve a substantial improvement in educational outcomes by simply moving from a historically black school to a historically white or Indian school (Taylor 2011).

Figure 2: Kernel density curves of Literacy 2007, 2008 and 2009 by ex-department



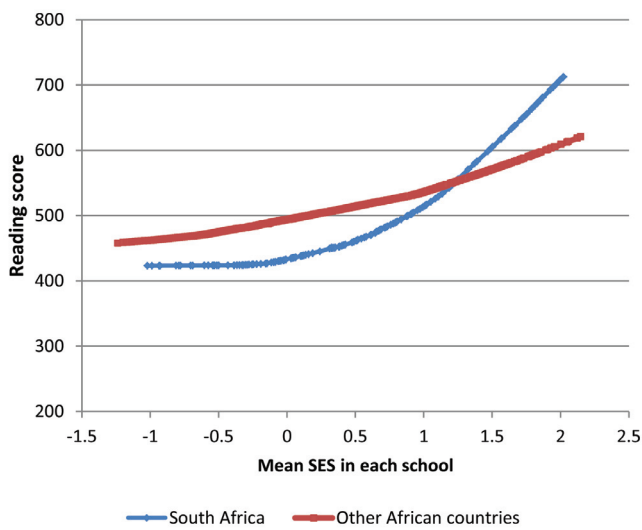
Source: Own analysis using NSES 2007 – 2009

Analysing PIRLS, we furthermore find that specific school characteristics impacted on student achievement differently, depending on the predominant language in the school. In this work, the test language chosen by the school (one of the African languages, versus Afrikaans or English) served as a crude proxy for the part of the historical school system. For the African language schools, extended instruction was associated with improved performance. Class size was not associated with large differences in student achievement within the Afrikaans and English sample of schools, but within African language schools, excessively large classes were associated with worse student achievement. More frequent diagnostic testing and class exercises were also linked to better performance

within the African language sample, but not within the Afrikaans and English sample (see Box 4 on p.11).

The detrimental impact of poverty on educational outcomes is well-documented in the literature on education and recognised as a challenge to education systems across the world. However, poverty seems to have an even more severe impact on learning in this country than it does in other African countries. Figure 3 shows the relationship between the average Reading score for Grade 6 learners across socio-economic status (using an index of household assets to ensure comparability across countries) for South Africa and a group of other African countries (Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe, as well as the island of Zanzibar in Tanzania, which has full jurisdiction over its own schools). This graph represents the socio-economic gradient, i.e. how test scores vary with socio-economic status (SES). In this case, it was fitted using Lowess smoothing lines, a non-parametric trend line, which is similar to a regression but does not presuppose that the relationship between socio-economic status and school performance is linear.

Figure 3: Lowess socio-economic gradients for South Africa and other SACMEQ countries, 2007



Source: Own analysis using SACMEQ III

This figure demonstrates that poverty itself cannot account for the poor performance of South African children – poor (low SES) South African children perform far worse in Reading than their equally poor counterparts in other SACMEQ countries. This may be attributable to the double burden that learners from poor communities in South Africa often face: there is the burden of poverty (operating on both an individual and institutional-social level) and then there is also the burden of attending a school that still bears the scars of neglect and underfunding under the apartheid dispensation.

One immediate reaction to this finding is that further

redistribution of resources is needed. But the analysis reported here shows that additional resources do not significantly improve the situation for poor schools. The problems appear to lie deeper and to be more systemic, possibly relating to factors such as management, motivation of teachers and expectations of parents. However, our findings regarding the factors constraining resource effectiveness in these schools should be regarded as tentative and exploratory, as these effects are difficult to pin down statistically. Thus there is great benefit in working with a number of datasets, which allow better verification of patterns across different models.

The role of education in the labour market

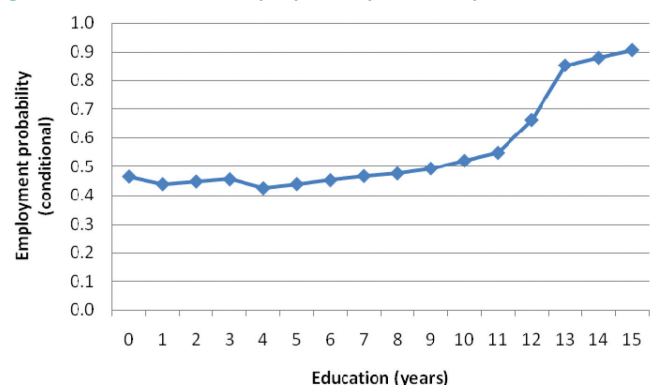
Education plays an important role in determining labour market prospects. Having left school early or having received a low-quality education, most children from poor households stand at the back of the job queue and are less likely to obtain stable and lucrative employment. As the most important source of income for the great majority of households is wages, lucrative employment is one of the main ways to escape poverty. Poverty can perpetuate itself via low educational attainment and low-quality education, resulting in dire labour market prospects, creating a vicious cycle that impedes social mobility.

Income inequality in South Africa is being driven not only by differences in the number of years of education attained, but also, to a large extent, by the quality thereof. Policies that address inequality by intervening in the labour market will have limited success as long as considerable pre-labour market inequalities in the form of significant differences in school quality persist.

Years of education and labour market prospects

Years of completed education are important both for the likelihood of employment and for setting wages. Additionally, there seems to be a non-linear effect at work in both these processes. Figure 4 shows that, up to Grade 11, an additional year of education does not improve employment prospects, but then the likelihood of employment increases dramatically with earning a Matric Certificate or more.

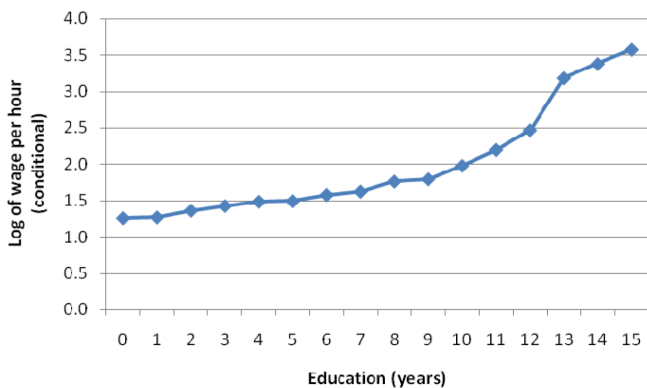
Figure 4: Conditional employment probability, 2005



Source: Own analysis using LFS 2007

Earnings functions capture the relationship between wages and the years of education of a worker. Research on the South African labour market has found convex returns to education, i.e. that the wage increase associated with an additional completed year of education is higher from Matric and beyond (Keswell & Poswell, 2004; Bhorat & Leibbrandt, 2001). Figure 5 shows that if one plots the log of the wage against years of education completed, the line becomes increasingly steep at high levels of educational attainment.

Figure 5: Conditional wage rate (log of hourly wage), 2005



Source: Own analysis using LFS 2007

High labour market returns to matric and weak assessment practices

Traditionally the shape of these curves is attributed to a scarcity of skilled labour and an abundance of workers with low skills. However, there is also an alternative explanation. A previous section described how weak assessment practices interfere with the education system's sifting process. These problems also have labour market repercussions. The sudden jump in wages and the likelihood of employment at Matric and higher levels may be attributable to the perceived quality of the externally assessed and monitored national Matric examination versus the noisy and unreliable information in internal assessments and grade progression. The flatness of both

the likelihood of employment and wage increases up to Grade 11 indicates that employers do not regard grade progression as a credible signal of quality and productivity of a job applicant. Employers appear to be uncertain about the cognitive skills associated with different grade attainment levels. At 12 years of education there is a dramatic rise in the likelihood of employment. According to this explanation, Matric is a threshold because the labour market considers this standardised and externally monitored national exam to be a credible signal of quality and productivity.

The 2007 Community Survey provides further evidence to illustrate the impact of education quality on employment and of how matric performance act as signal of labour quality and future productivity. The survey provides information on three broad categories of Matric exam achievement, namely attempted and failed, passed, and passed with university exemption (endorsement). Focusing on black workers only, so as not to conflate the effects of race and education quality, the survey shows that those who had attempted but failed Matric faced an unemployment rate of almost 48%. In contrast, those who had passed Matric but failed to obtain university exemption had a lower unemployment rate of 42%. In comparison, students who passed Matric with a university exemption but did not continue to further studies had a considerably lower unemployment rate of 36%.

Performance in Matric (based on these categories) also affected wages earned for those who found jobs: Those black workers who had no higher qualifications than Matric but who indicated that they had achieved a university exemption in Matric earned almost twice as much as those who had failed Matric (94% higher), and almost a third (30%) more than those who had passed it but without university exemption.

Clearly, the quality of the Matric counted. Analysis for other race groups showed similar, though more muted,

BOX 3

Progress with Early Childhood Development (ECD)

The National Income Dynamics Study (NIDS) suggests that in 2008 57% of five-year-olds were enrolled in pre-schools (excluding the "day-mother" and "gogo" categories). Data from General Household Surveys between 2002 and 2009 indicate that enrolment of five-year-olds has increased, although there is still considerable ground to cover before reaching the target of 100%. SACMEQ 2007 suggests that 43% of learners in the poorest 20% bracket received little or no pre-school education, whereas 85%

of the richest learners attended pre-school for at least a year.

Following the introduction of the ECD targets, there were concerns that the quality of ECD institutions may be so variable that there may not be much benefit in attending such institutions.

Analysis of the South African sample of the SACMEQ 2007 data suggests that on average we do see a benefit in attending pre-school: If a child has attended at least a year of pre-school education, this is

associated with higher achievement in Grade 6. Additional years of pre-school over and above the first year, however, do not appear to yield much further benefit. Since poorer students are likely to receive an inferior quality of pre-school education, an improvement in the quality of pre-school education is therefore likely to make a greater contribution to closing the socio-economic gap than expanding children's exposure to pre-school education.

effects of the quality of Matric results on both employment and earnings.

Quality of education and labour market prospects

Internationally, attempts to account for the quality of education in earnings functions have suggested that quality of education may be more important for an individual's earning capacity than the number of years of education (Murnane et al, 2001; Hanushek and Woessman, 2007). In South Africa there is a further imperative: to examine whether measures of education quality may help explain the large and persistent racial differences in employment and wages (e.g. Burger and Jafta, 2006).

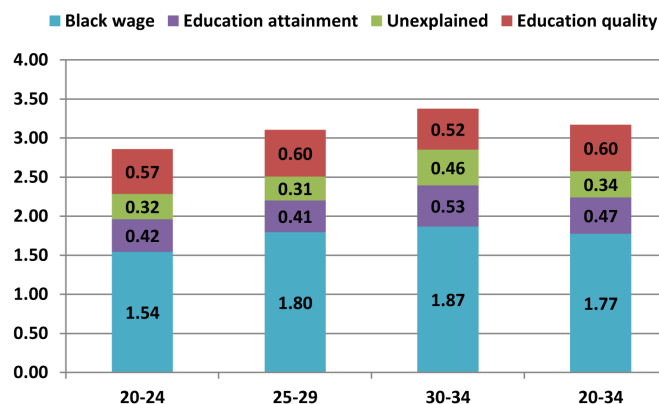
A proportion of these racial differences can be attributed to productive characteristics such as years of education. There remains, however, a large unexplained component, often assumed to represent labour market discrimination. During the apartheid era there were large discrepancies between the spending on each of the racially based education departments, with the education system designated for black learners (ex-DET) receiving considerably less than white learners. It thus appears plausible that some of the unexplained component of the racial wage gap may be attributable to differences in the quality of education received by black versus white workers.

Unfortunately, it has been difficult to examine this question because of a lack of appropriate data capturing the quality of education with, for instance, a cognitive skills test. Two alternative strategies were used in this research project to deal with this issue, viz. simulation of cognitive skill levels based on Matric data and attainment levels, and the use of new data from the National Income Dynamics Survey (NIDS) of 2008.

In the absence of good test data for workers in the labour force, simulations offered another alternative: constructing a synthetic model of cognitive skill based on the observed patterns in Matric results, educational attainment and earnings functions (See Box 6 on p. 12). The estimates indicate that differences in cognitive skills (quality of education) accounted for almost half of the gap in the wages of white versus black workers.

This decomposition is shown in Figure 6. The last column shows for the 20-34 year-old cohort that the log of the hourly wage (in 2000 Rand values) for blacks was 1.77, far below the 3.17 of whites. This gap of 1.40 in the log of wages between these two race groups could be explained as follows: 0.47 by education level and experience (so-called productive characteristics), 0.60 by superior quality of education (as estimated by the model) and 0.34 is the remaining unexplained part of the wage gap (due to rounding, figures do not add up exactly).

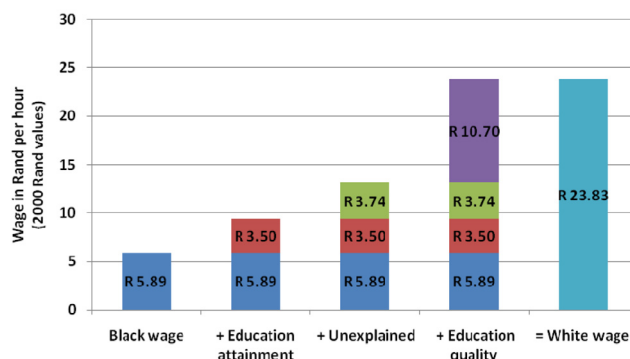
Figure 6: Decomposition of white/black differential in log(wage)



Source: Own analysis using simulations

Figure 7 shows these amounts as hourly wages (in 2000 Rand values). This indicates that differences in education quality produce a wage gap of R10.70 per hour. Thus, if all other sources of differences in wages could be eliminated (here including years of education, experience and also the unexplained component) then this would still leave a gap that is almost twice the size of the average black wage.

Figure 7: Potential effect of education on hourly black wages, age group 19-34



Source: Own analysis using simulations

NIDS' numeracy test scores pick up large differences in the performance of different population groups with the same levels of educational attainment (De Vos, 2011). Taking into account various statistical concerns (see Box 6 on p. 12), Du Rand, Van Broekhuizen and Von Fintel (2011) find that numeracy scores have a strong association with wages and that differences in the numeracy test scores could account for almost one-fifth (18.6%) of the unexplained racial wage gap, i.e. the gap between black and white wages that cannot be explained by differences in productivity and years of experience of workers.

NIDS asked respondents to provide the name of the school they attended. This allows the estimation of an alternative set of school quality indicators based on Matric results. This measure of school quality accounted for more than a third (36.8%) of the unexplained racial gap in wages.

The need to analyse the two "sub-systems" separately

Many authors, social commentators and politicians have used the idea of "two economies" or "two South Africas" to describe the divided nature of various aspects of South African society. The education system in South Africa can similarly be characterized as consisting of two "sub-systems" that have very different historical backgrounds and continue to perform at different levels of effectiveness.

The majority of South African children are located in the historically disadvantaged system, which continues to be disadvantaged as a result of poverty and all the educationally detrimental factors associated with poverty. On average, children in these schools demonstrate low proficiency in reading, writing and numeracy.

The second sub-system consists mainly of historically white schools and produces educational

achievement closer to the standards attained in developed countries. This second system still serves mainly white and Indian children, but these schools are increasingly attended by black and coloured middle-class children too.

Not only is this a useful distinction for descriptive purposes, but there are important statistical and methodological reasons to analyse the two sub-systems separately when investigating what drives educational achievement in South Africa. Particular school inputs, teacher practices or other characteristics may affect student achievement differently across the two sub-systems. It is possible, for example, that an advanced media technology may be effective in the well-functioning system but ineffective in the historically disadvantaged system where schools may not have the expertise to

implement the technology or the security to protect the equipment from theft and vandalism. In this way, important dynamics in one section of the school system can be glossed over by estimating a single model for the entire school system.

Alternatively, it is possible that a single model will suggest a relationship that is in fact invalid and is driven by differences between the two sub-systems. For example, it may be that within each sub-system additional resources do not produce improved student achievement, but that the one system has far superior resource endowments than the other and also produces better student achievement. Treating these two systems in a single model would suggest that additional resources do lead to better student achievement, when in fact this merely reflects overlapping differences between the two systems.

Including measures of quality of education clearly increases the proportion of the racial wage gaps that can be explained. But despite this progress, two approaches give different estimates of the contribution of quality of education and there is unfortunately no strong argument to prefer one over the other. Referring back to Figure 6 above, our estimates for the part of the log wage gap that could be explained by differences in education quality range between 0.17 and 0.34 using the test scores from NIDS. This is considerably less than the 0.60 observed in the last column of that figure based on the simulation model, thus leaving a far larger unexplained wage gap.

Income inequality and wages

Most income derives from wages, and most inequality in wage income between households results from differences in wage levels and in the number of employed wage earners. For instance, an analysis of the IES2005 shows that differences in household wages explain more than three-quarters of overall income inequality.

Decomposition of wage earnings differentials between households by Leibbrandt, Woolard & Woolard (2010) found that more than two-thirds of the inequality in wage income between households was the result of unequal wage income, rather than the proportion of household members that had jobs. The IES2005 estimates that if wages were the only source of income the Gini coefficient would have been

0.777. Considering only the approximately two-thirds of households with wage income, the Gini coefficient remains high at 0.651. (The Gini coefficient is a measure of the inequality of a distribution – a value of 0 expressing total equality and a value of 1 maximal inequality.)

Thus most income inequality originates in the labour market, through the distribution of jobs but more importantly for inequality through the wage formation processes. The pattern of wage inequality itself needs to change before aggregate income distribution can change in a major way. Thus reduced income inequality must start with a reduction of inequality in wage earnings, as high wage inequality effectively sets a floor to income inequality.

Some see more jobs as an answer to this, but a simulation exercise using IES2000 data showed that jobs would have had a beneficial effect on poverty but only a minor effect on inequality: Even the overnight creation of as many as 2½ million additional jobs would have reduced the Gini coefficient by only about 0.033, but the poverty headcount ratio by almost 9 percentage points. The low education levels and limited experience of those currently unemployed mean that even if they were employed, it would probably have been at low wages, thus having little impact on wage or income inequality. In contrast, an average across-the-board real wage increase of as much

BOX 5

Monte Carlo simulations to estimate the effect of education quality on wage gaps

One method used to establish the effect of cognitive skills on labour market outcomes was based on Monte Carlo simulations that generated estimates of cognitive skill (Burger & Van der Berg, 2011). Using data from household surveys it was possible to determine educational attainment by race for different age cohorts. To obtain estimates of cognitive skill, an underlying normal distribution of cognitive skills was generated and used to calculate a pupil's expected matric score before entering school. The latter represent

a combination of innate ability and other social factors.

Information regarding within-school matric assessment was used to estimate the relationship between cognitive ability and the decision to drop out of school, which has been shown to differ across race groups due to weak assessment practices in black schools.

Based on these calculations it was then possible to observe which initial distributions came closest to generating the known matric

distribution of marks. Since it is likely that students leaving school at different grade levels may have different levels of cognitive ability, the above distributions enabled us to vary cognitive scores based on race and educational attainment. These estimates were then used as an input in the earnings functions reported in the paper. Earnings functions that considered education level augmented by these cognitive skills performed considerably better in explaining racial wage gaps than education attainment by itself.

as 30% would have reduced the poverty headcount by only about 4 percentage points, while nudging the Gini coefficient slightly higher (0.011 points).

The labour market is at the heart of inequality, and central to labour market inequality is the quality of education. To reduce income inequality substantially requires a different wage pattern based on better human capital for the bulk of the population. Prospects for this at present appear inauspicious. Policies that address inequality by intervening in the labour market will have limited success as long as the considerable pre-labour market inequalities in the form of differential school quality persist.

Looking ahead, the demand for skills can be expected to grow further as the economy grows. Enhancing skills through more and a better quality of education is necessary simply to keep up with the increasingly skills-intensive nature of growth. This would allow a larger share of the population to join the top end of the labour market and to become economic insiders, able to share fully in the fruits of economic development. But only if this happens on a massive scale, would most of the poor benefit. As more

people start earning high incomes, overall inequality would start declining, though the wage differentials between high-skilled and low-skilled workers would remain large unless the growth of skills exceeds the growth of demand for this type of labour. Only then will the wage differential between skilled and less skilled workers decline. The prospects for this occurring in the near future are limited.

Some conclusions and policy implications

The research papers in this project cover a wide scope and each has implications for policy. We can only mention a few conclusions and policy implications here:

Prioritising managerial efficiency: The impact of resources on student achievement is crucially mediated by how well they are managed. This explains why additional resources often do not lead to improved student outcomes in many of the less well-functioning schools. In contrast, efficient schools are able to make the most of whatever resources they are given. Although the MTSF already identifies the improvement of managerial efficiency as a policy objective, this evidence supports it being given the highest priority.

BOX 6

Statistical concerns with numeracy tests and reporting of school name in NIDS

The numeracy test was a voluntary segment of NIDS and only a relatively small proportion of respondents agreed to take the test (22% of the targeted sample of working age individuals). Our analysis shows that those who took the numeracy test were more educated, more confident in their writing abilities, and were more likely to search for jobs. They also had higher returns to education than the sample as a whole.

Respondents were also asked which high school they had attended. This enabled us to match this information with high school matric results in order to generate another measure of school quality. However, there were also issues with this indicator. Those who provided usable school quality data tended to be younger and more educated. Younger individuals may have had better recall of which schools they attended because they

left school more recently, while older individuals may have attended schools whose names could have changed in the interim or are no longer in operation.

All of these factors required corrections in the estimates via instrumental variables and double Heckman estimates. The latter effort was regarded as more successful than the former and consequently these are the estimates used in the report.

Rewarding effective managers: The indicators of good management identified in this research should not be interpreted as more than exactly that: indicators that point to the characteristics typically exhibited by good managers, rather than levers to be manipulated by policy to achieve improved student outcomes. Command and control measures aimed at forcing teachers to follow best practices may well empty such practices of their value through introducing the perverse incentive to window-dress those practices at the expense of focusing on the central task of teaching. A better and indeed more ambitious route for policy would be to explore ways to attract, train and support better principals, and to replace those at the head of dysfunctional schools.

Assessment quality and standardised national assessments as feedback: Assessment in most schools is both far too lenient and unreliable as a sorter amongst students of differing ability, often leaving learners under an illusion regarding their preparedness and leading to lenient and largely random grade progression. Thus the quality of assessment needs to be improved drastically. The Annual National Assessments launched this year may encourage better assessment practices within schools. It should be designed and implemented so as to provide information to students, teachers and parents regarding true performance. This would enhance accountability of schools to their stakeholders. But ideally, a standardised assessment in Grade 9 should be linked to an official qualification to provide some educational currency to youths who do not attain a matric certificate and therefore have nothing to signal their skills in the labour market. Better assessment and feedback would also contribute to better subject choices.

Focus on core skills: Proficiency in reading and writing English, along with computer literacy, are vital determinants of employment and earnings prospects. Policies should ensure that learners are sufficiently equipped in this regard.

Increase learning time: Secondary school learner absenteeism is often for reasons other than poor health or financial constraints. This indicates that there may be scope for increasing learning time in schools through, for instance, advocacy campaigns aimed at parents to emphasize the benefits of education.

Enrolment vs. performance: Secondary level enrolment in South Africa is already high by international standards, with marked improvements since 2003, though the country does not perform well in the number passing Grade 12. Many children reach Matric insufficiently prepared for their final exam. The emphasis should be on improving the quality of education of those engaged in such education,

rather than the numbers, i.e. on Grade 12 completion and quality rather than enrolment. This would equip learners better for the labour market and improve their chances of entering tertiary education. This is desirable for the individuals whose job and earnings prospects are improved, but it will also be beneficial at a national level, because more secondary and tertiary graduates improve a country's long run economic growth potential.

Access to learning resources, particularly reading textbooks: One way to achieve better outcomes would be to improve access to learning materials, since households cite lack of books as a main challenge. This supports the policy shift aimed at addressing this problem. Learners from low-income households are less likely to have direct access to textbooks. Since there is a strong positive correlation between reading-textbook access and reading performance, targeting policies and funds towards provision of reading textbooks will have an impact on performance, especially for poor learners. The research shows that only when learners have their own reading textbook or share it with no more than one other person, do they experience performance gains.

Homework frequency: The research shows performance gains associated with those students who received homework either once or twice a week or most days of the week. This effect was most pronounced for maths. Practical policies that encourage teachers to prescribe homework and enable students to complete that homework (where the home environment may not be conducive to doing so) should be explored. These policies are inexpensive but may yield significant gains in student performance, especially for Mathematics.

Encouraging better curriculum coverage: The evidence suggests that effective schools offer thorough coverage of the curriculum. So there is scope for policies aimed at teachers' professional development, firstly to ensure that they are technically able to teach all of the required elements, and secondly to provide them with the necessary time management- and prioritisation skills so that they can deliver within the set academic timeframe. Policy should also ensure that Learner Teacher Support Materials such as textbooks and workbooks are explicitly designed to facilitate the extensive coverage of curriculum and exercises, making this easier for both teachers and students to implement.

Teacher knowledge and quality: Teachers' subject expertise has a small positive impact on learner performance. While improving teacher subject-knowledge is likely to provide modest gains, at the Grade 6 level policy should focus rather on helping teachers convey the subject material to their students.

Pre-school education: As large inequality in literacy and numeracy is evident as early as grade 3, substantial efforts must be directed at improving education quality in primary schools and even before that in early childhood. Thus the encouraging trend towards greater enrolment in pre-school should be pursued and its quality should be improved. Providing one year of quality pre-school education to all children is likely to improve performance more than extending the period involved. This is especially true for poorer children, who otherwise start primary school at a

disadvantage.

Reducing income inequality requires better education: Substantial reduction in income inequality will only be possible if pre-labour market inequalities, specifically inequalities in the quality of education, are reduced.

Affirmative action policies cannot substitute for improving the skills of poor people: The effectiveness of affirmative action policies in the labour market will always be limited by a school process that leaves the poor with an ongoing skills deficit.

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Data sets

The research dealt with a large number of datasets in order to obtain the fullest possible picture of the topic that was possible within constraints of researchers and time. The following were the most important ones:

- All the General Household Surveys (GHS) from 2002 to 2009.
- A number of Labour Force Surveys (LFS), in particular the last two containing wage data, 2007a and 2007b
- The Income and Expenditure Survey (IES) of 2005/6
- The National Income Dynamics Study (NIDS) of 2008
- The South African data for SACMEQ III for 1997
- PIRLS 2006
- All three waves of the National School Effectiveness Study (NSES), entailing Grade 3 for 2008, Grade 4 for 2009 and Grade 5 for 2010.
- Matriculation (National Senior Certificate) data for 2009.

Research papers

Ten research papers were generated by this research project. Not all this research or even the main findings can be presented in this paper, so the interested reader is referred to the website of the Department of Economics at Stellenbosch University, where the following ten papers can be found with other Working Papers produced for the Department:

- Gustafsson, M. 2010. "Policy note on pre-primary schooling: An empirical contribution to the 2009 Medium Term Strategic Framework". Working Paper 05/2010, Stellenbosch University: Department of Economics
- Du Rand, G., van Broekhuizen, H., & von Fintel, D. 2010. "Who Responds to Voluntary Cognitive Tests in Household Surveys? The role of labour market status, respondent confidence, motivation and a culture of learning in South Africa". Working Paper 27/2010, Stellenbosch University: Department of Economics
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