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Improving Education Quality in South Africa

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By Fabrice Murtin

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ABSTRACT/RESUME

Improving education quality in South Africa

South Africa has achieved remarkable progress in educational attainment relative to other emerging countries, but the quality of basic education for a large fraction of the Black African population is still very low. This study identifies several hurdles to the upgrading of basic education quality, such as the lack of investment in school infrastructure and learning materials in disadvantaged areas, uneven administrative capacity at the local level, low teacher quality and poor teaching of English among Black Africans. Bold action is recommended to empower schools with more physical resources, more competent school leadership and an accountable teacher workforce. Skill mismatches of supply and demand on the labour market may be further addressed by vocational education reforms and an alleviation of credit constraints at the tertiary level.

This Working Paper relates to the 2013 *OECD Economic Survey of South Africa* (http://www.oecd.org/eco/surveys/southafrica2013.htm).

JEL classification codes: I20, I24, I25, I28, J24

Keywords: Education; education quality; school leadership; teacher; teacher accountability; return to schooling; skill mismatch; test score

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Améliorer la qualité de l'éducation en Afrique du Sud

L'Afrique du Sud a accompli des progrès remarquables en matière d'éducation par rapport à d'autres pays émergents, mais la qualité de l'éducation de base reste très faible pour une large partie de la population africaine noire. Cette étude met en évidence plusieurs obstacles à l'amélioration de la qualité de l'éducation de base, notamment le manque d'investissement dans les infrastructures scolaires et les matériels pédagogiques dans les zones défavorisées, des capacités administratives inégales au niveau local, une mauvaise qualité des enseignants et un enseignement médiocre de l'anglais aux élèves africains noirs. Il est recommandé de prendre des mesures audacieuses pour doter les écoles de davantage de ressources matérielles, d'une équipe de direction plus compétente et d'un corps enseignant responsable. L'inadéquation des compétences entre l'offre et la demande sur le marché du travail peut en outre être traitée par des réformes concernant l'enseignement professionnel et par l'allègement des contraintes de crédit dans l'éducation supérieure.

Ce Document de travail se rapporte à *l'Étude économique de l'Afrique du Sud, 2013* (http://www.oecd.org/fr/eco/etudes/afriquedusud2013.htm).

Classification JEL : I20, I24, I25, I28, J24

Mots clés : Éducation ; qualité de l'éducation ; direction d'école ; enseignant ; responsabilité des enseignants ; rendement de l'éducation ; inadéquation des compétences ; test scolaire

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TABLE OF CONTENTS

IMPROVING EDUCATION QUALITY IN SOUTH AFRICA 5
South Africa has reached high educational attainment but quality of education remains dismal 5
Towards universal attainment in primary and secondary schools 5
Basic education displays low quality and high inequality 8
Private returns to educational investments are large 10
Improving education quality 12
The education system is missing physical and human resource 12
Increase cost-efficiency through better leadership, accountability and learners support 21
Repairing skill supply and demand mismatch on the labour market 25
Bibliography 29
Annex A1 Educational attainment and labour market outcomes 33
Annex A2 Education quality and labour market outcomes 36
Annex A3 The determinants of pupils tests scores at grade 9 38

Figures

1. Mean years of schooling 6
2. Attendance rates 7
3. Mean years of schooling by ethnic group 8
4. International Tests of Scholastic Achievement 9
5. Returns to schooling, 2010 – Males 10
6. Labour market outcome of schooling quality 12
7. Primary and secondary resources 13
8. Language scores 16
9. Pupil-teacher ratio 17
10. Projected pupil-teacher ratio 18
11. Stratification of pupils socio-economic status 20
12. Language test score 25
13. Employment distribution and growth by industry 27
A1. Wage ratio with respect to population with only primary schooling 34

Boxes

Box 1. The South African education system 6
Box 2. Key priorities identified in National Development Plan, Action Plan to 2014 and the New Growth Path 14
Box 3. Management instruments to improve school governance 22
Box 4. Main education recommendations 28

IMPROVING EDUCATION QUALITY IN SOUTH AFRICA

By Fabrice Murtin[1]

Educational attainment has increased rapidly in South Africa in comparison to other emerging countries, as the country exhibits nearly full enrolment in primary and secondary schooling as well as a quick expansion in pre-primary schooling and tertiary to a lesser extent. However, the education system remains largely dual as long-lasting consequences of apartheid have not been suppressed yet. In particular, the quality of basic education is still very low for a large fraction of the Black African population, as shown by a number of regional and international surveys of pupil performance at school.

This study identifies five main areas where policy reforms should contribute to improve education quality. First, education resources should be increased and equalised across schools as many disadvantaged areas still suffer from school infrastructure backlogs, low availability of learning materials in the form of textbooks, desks and computers as well as excess class size. Besides, school accountability and management capacity should be strengthened, teacher training could be improved, while English should be introduced earlier to prepare pupils to the switch to English as a language of instruction. Finally, a number of reforms could reinforce the links between the vocational education system and the labour market, while an expanding loan system could foster enrolment at university.

The first section of this study describes recent trends in educational attainment, education quality and its outcome on the labour market. This is followed by an examination of policies needed to improve the quality of basic education and the matching between skills and labour market needs.

South Africa has reached high educational attainment but quality of education remains dismal

South Africa has reached high educational attainment relative to other emerging countries, but education quality has been low and very uneven. There appear to be large returns to education at the upper secondary and tertiary levels and a significant payoff to education quality in the labour market, suggesting that there would be high economic returns to increasing the supply of high-school graduates with good passing marks who are able to go on to tertiary education.

Towards universal attainment in primary and secondary schools

Educational attainment has reached high levels relative to emerging economies

Sustained educational progress has taken place in recent decades, including the last years of the apartheid era and continuing since the advent of democracy. As a result, 89% of the population aged over 15 years was literate in 2004, a proportion that reaches 98% among the 15-24 year old population. As shown in Figure 1, average years of schooling attained by young adults aged 25-29 year old have increased by about one year every decade since 1960, which is reasonably fast by international standards. Between 1960 and 2010, young South Africans have closed about half of the gap in years of schooling relative to young Americans, but no convergence with respect to the world educational attainment leader (Korea) has been observed over the last twenty years. Today, South African young adults spend more years at school than their counterparts from other emerging economies such as China or India. Mean educational attainment of the young adults cohort is about the same as in Brazil.

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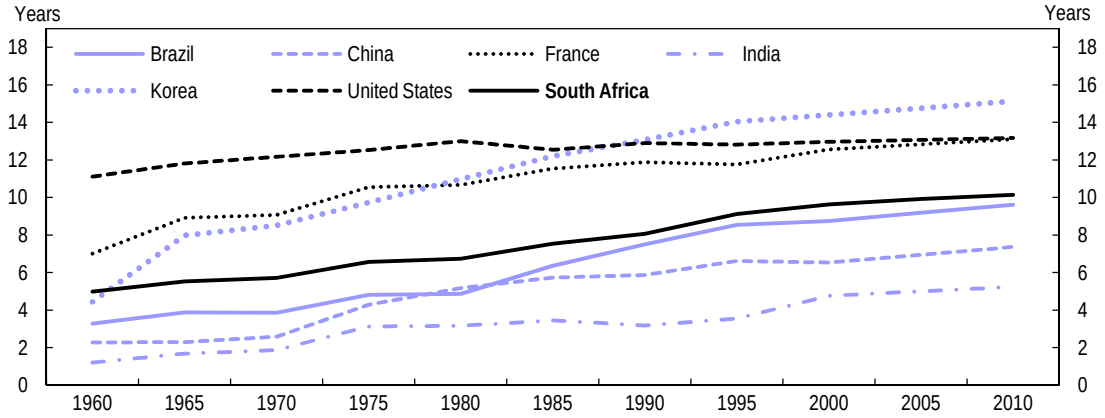
1. Fabrice Murtin is an Economist on the Czech Republic and South Africa desk in the Economics Department of the OECD. This Working Paper is based on Chapter 1 of the OECD's 2012 Economic Survey of South Africa which was prepared under the responsibility of the Economic and Development Review Committee. The author is grateful for invaluable comments received from Andrew Dean, Bob Ford, Andreas Woergoetter, Geoff Barnard, Beatriz Pont, Paolo Santiago and other colleagues from the OECD. Josiane Gutierrez and Mikel Iñarritu are acknowledged for secretarial assistance.

The increase in educational attainment has nevertheless slowed down recently. While the annual change in mean years of schooling among young adults was 0.10 over the 1960-2010 period, it was only 0.04 between 2005 and 2010. Over the same period, annual changes in mean years of schooling have been larger in other emerging economies such as Brazil, China or India, and also among more developed countries like France or Korea, such that South Africa is no longer clearly converging towards advanced country levels of years of schooling. Hence South Africa would need to restart the education engine to maintain its leadership among major emerging countries in terms of educational attainment.

Figure 1. Mean years of schooling

Mean years of schooling of population 25-29



Source: South Africa data is based on *Community Survey* (Statistics South Africa, 2007) and calculations made by Louw, van der Berg and Yu (2006). Population aged 25-29 is proxied by population aged 27. Other countries are drawn from OECD (2012a) long-term projections.

School attendance in South Africa

The relatively high level of educational attainment in South Africa is largely attributable to near full enrolment in primary and secondary education, with corresponding gross enrolment rates of 102% and 94% in 2009 (World Bank, 2012).[2] This performance is in line with the South African Schools Act of 1996, which made schooling mandatory from age 7 until 15 or grade 9 (Box 1).

Box 1. The South African education system

Education for black South Africans during the apartheid regime was under central government control, which reinforced racial and geographical segregation. Enrolment increased but infrastructure was largely inadequate, pupil-teacher ratios were huge and the curriculum was biased and openly racist. In 1986 spending per pupil was nine times higher for white learners than for Black Africans (OECD, 2008).

Since 1994 the government has profoundly reshaped the education system, which has been broken down into nine provincial sub–systems. Education financing has been redirected to take into consideration equity and affordability issues. School governance has been decentralised, with greater autonomy devolved to school governing bodies, which among other things received the right to charge fees. The curriculum has been reviewed several times.

2. The gross enrolment rate is defined as the number of pupils at school divided by the school-age population. Because of pupils repeating grades, the gross enrolment rate can be larger than 100%. The net enrolment rate is equal to the number of pupils of the expected school-age divided by the school-age population, and hence it is always lower than 100%.

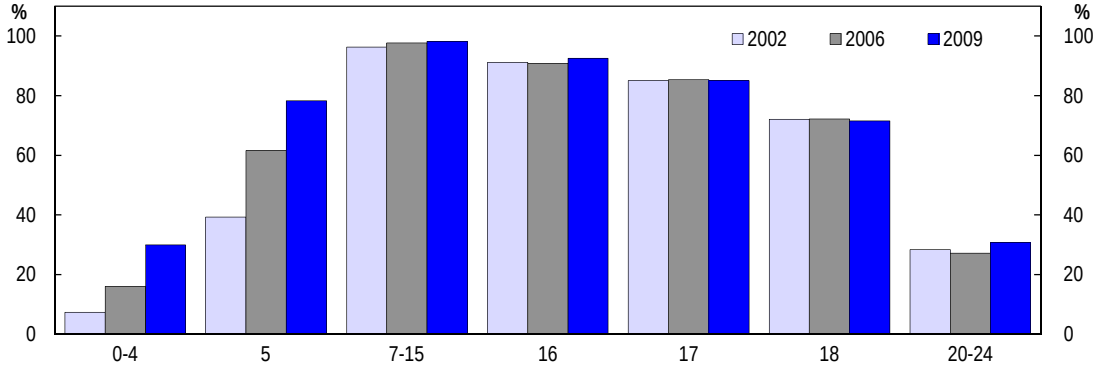
Education is compulsory in South Africa from age seven (grade 1) to age 15 or the completion of grade 9 and enrolment in these grades is almost universal. Between grades 10 through 12 learners can choose between a vocational training route in a Further Education and Training college or to continue their education in the basic education system. Those who choose the vocational route complete it with a National Certificate Vocational (NCV). The nationally administered National Senior Certificate (NSC) taken in grade 12 represents the completion of basic education and continues to be the preferred choice. Enrolment rates are high, but levels of grade repetition are also high especially in grades 10 and 11 and the majority of learners (58%) still leave the schooling system without completing a national leaving certificate (NCV or NSC) commonly known as matric.

Over the last decade, substantial progress in attendance rates at educational institutions have been recorded for children below age 7. As shown in Figure 2, the share of children aged 5 attending an educational institution doubled between 2002 and 2009. Similarly, early childhood education (below age 5) is expanding rapidly and reached 64% of children aged 3-5 years in 2010 (Department of Basic Education, 2012) thanks to the considerable efforts made recently by the government to increase the number of early education facilities.

As with early childhood education, tertiary education has been growing, whereas the diffusion of education at the upper secondary level has come to a standstill over the last decade. At age 18, 71.5% of youth attended an educational institution in 2009, the same percentage as in 2002. The proportion of cohorts aged 16-18 years attending upper secondary has not varied since 2002 (83% according to Department of Basic Education, 2011a). Enrolment in higher education has increased at a 5% annual rate since 2000, but reached only 840 000 students in 2011 or 18% of the 18-24 years population (about the same level as in Brazil, a country with comparable income and similarly high income inequality). When all educational institutions are considered (including vocational schools), the enrolment rate of the 20-24 years age group reaches 30%, a slightly higher percentage than in 2002.

Figure 2. Attendance rates

Share of population attending an educational institution by age group



Source: *Education for All,* Department of Basic Education, 2010a.

Educational attainment remains polarised but the gap has narrowed

Almost twenty years after the end of apartheid, the education gap between Black Africans and Whites has narrowed as shown by Figure 3, which splits mean educational attainment by race as calculated by Louw, van der Berg and Yu (2006).

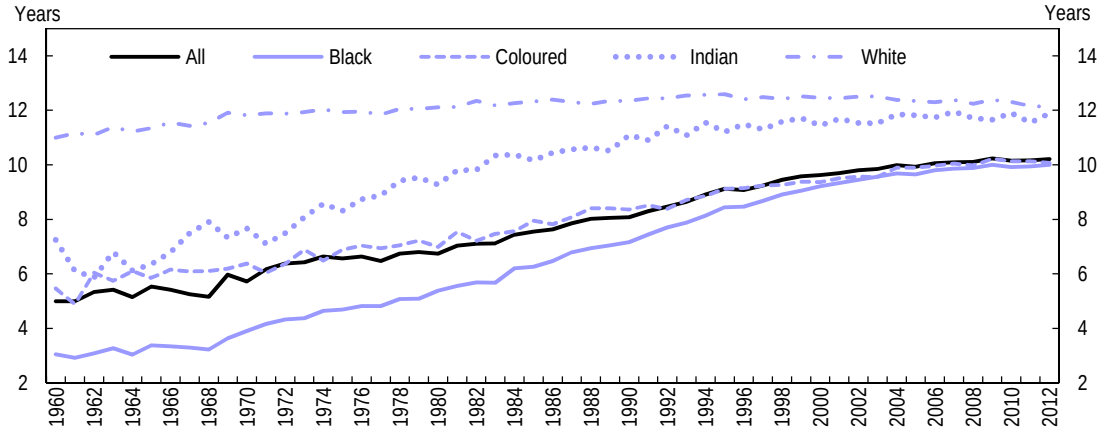
Yet, education outcomes still differ a lot across race. For instance, the pass rate in 2009 in the National Senior Certificate examination, which corresponds to grade 12 in the general education system, was equal to 57% among African, 80% among Coloured, 89% among Indian/Asian and 99% among White, with an average of 62% across all pupils.

Educational attainment and matric pass rates are also unevenly distributed across regions with higher rates in more urbanised areas. While the percentage of children aged 7-15 attending compulsory basic education is broadly the same across regions, gross enrolment rates in secondary schooling vary widely. Moreover, attendance rates are often inversely related to the pass rate at the matric (Department of Basic Education, 2010a).

In contrast, South Africa has broadly achieved gender parity in school enrolment. This is a remarkable achievement given that gender parity is not observed in other emerging countries like India or Brazil.

Figure 3. Mean years of schooling by ethnic group

Mean years of schooling at age 27



Source: South Africa data is based on *Community Survey* (Statistics South Africa, 2007) and calculations made by Louw, van der Berg and Yu (2006).

Basic education displays low quality and high inequality

There is much evidence, from both international and national surveys, that education quality remains poor overall and uneven across regions and population groups, which largely reflects the country's historical legacy.

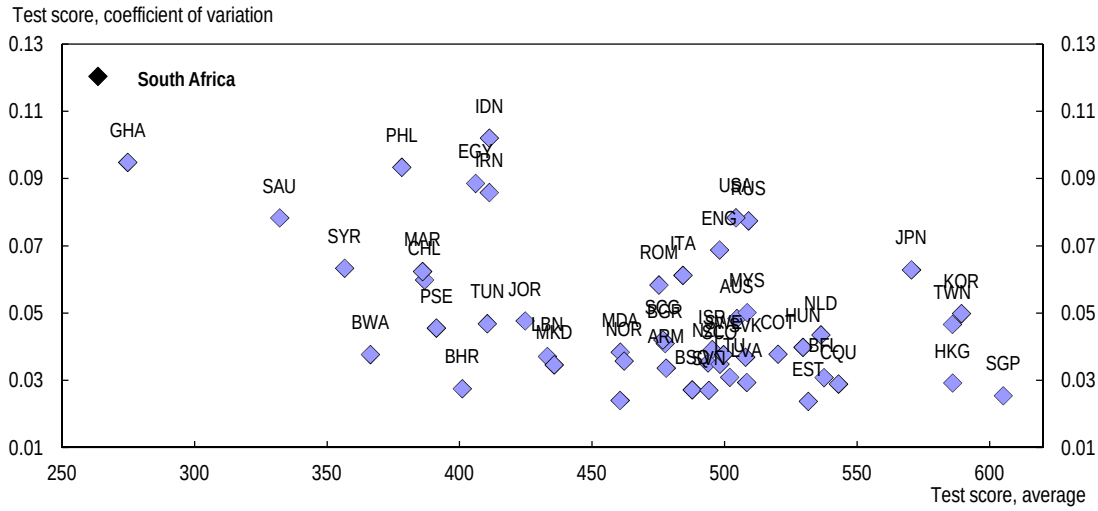
Evidence from international surveys

The rankings of South Africa in international tests of pupils' competencies in reading (PIRLS, 2006) and mathematics (TIMSS, 2003) have been dismal. Countries with lower income such as Indonesia or Egypt have performed better in the latter surveys, with South Africa displayed the worst average test scores among the sample of countries (Figure 4). Most recent evidence (TIMSS, 2011) show a marked improvement in average test score, but South Africa still ranks at the bottom of the international spectrum. Other regional surveys of education performance display comparable results. With a GDP per capita less than one fifth as large, Kenya performed significantly better than South Africa in SACMEQ (2007) reading and mathematics tests in 2000 and 2007. Moreover, there was no improvement in SACMEQ tests between 2000 and 2007. These findings underline the need for urgent and sustained intervention. Importantly, the experience gained at the international level could be actualised if South Africa decided to join the Programme for International Student Assessment (PISA) and the Teaching and Learning International Survey (TALIS), and to undertake an OECD Review of Evaluation and Assessment in Education like Mexico recently (OECD, 2012b).

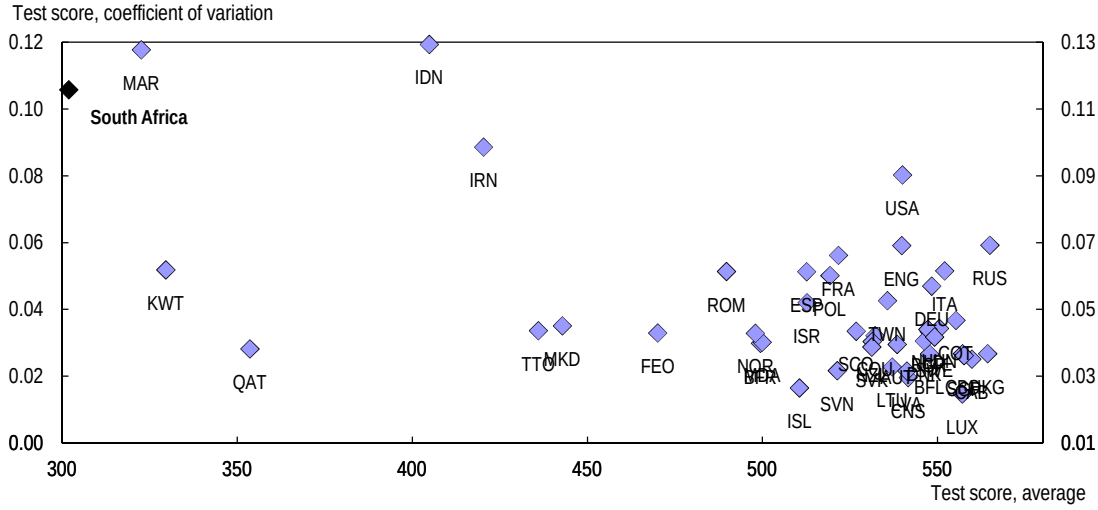
South Africa's poor performance in terms of average scores in international tests and regional surveys is explained by the large fraction of students who do not reach basic qualification standards, while the top quintile of students perform reasonably well. As a result, inequality in test scores is among the highest observed in the sample (see Figure 4). Improving the performance of students at the bottom of the test score distribution therefore constitutes the best strategy to improve average results and simultaneously reduce inequality in educational outcomes.

Figure 4. International Tests of Scholastic Achievement

A. Mathematics Achievement (TIMSS 2003)



B. Reading Achievement (PIRLS 2006)



Source: TIMSS (2003), PIRLS (2006) and OECD calculations.

National evidence

At the national level, several indicators such as net enrolment and repetition rates point to quality issues in the education system. For instance, the net enrolment rate in primary education has been falling since 1995 and was substantially lower (85% in 2009 according to World Bank, 2012) than the gross enrolment rate, a gap explained by a high repetition rate (10.3% in 2010 according to Department of Basic Education, 2012). The repetition rate in primary education fell significantly over the 1997-2005 period, but then picked up again. Repeating a grade occurs at a higher frequency rate in grade 1 (13.1%) and in years that precede the matric examination (24.4% and 24.3% in grades 10 and 11), an outcome likely explained by schools aiming to improve their matric pass rate.

There is still a substantial fraction of children left out of school, although there is conflicting evidence on this issue. On the one hand, the World Bank (2012) reports that the proportion of children of primary school age being out-of-school has increased over time, but on the other hand, the share of out-of-school children among the cohort aged 7-15 years fell between 2002 and 2009 (Department of Basic Education, 2010a, Table 7, p. 21). One hypothesis that would reconcile these two views is that an increasing proportion of children join school with some years of delay, but that fewer children never go to school.

Private returns to educational investments are large

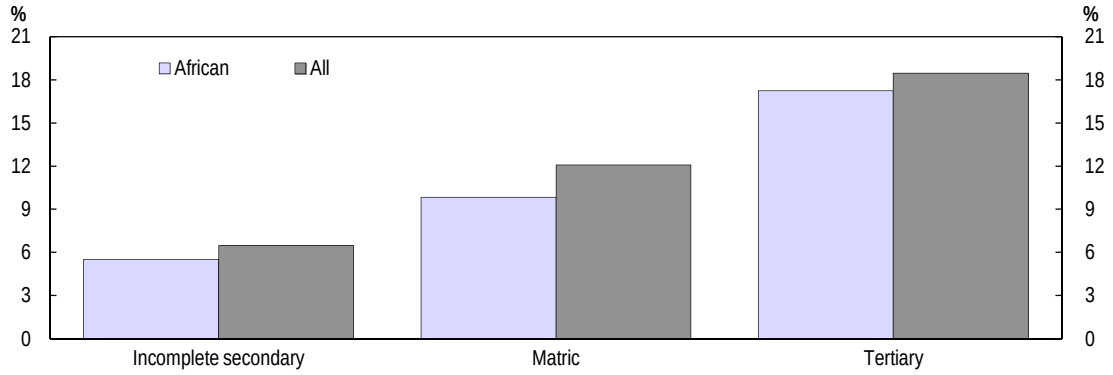
This section describes original evidence on the level and trend of private returns to schooling. Private returns to schooling are shown to be large, especially at the tertiary level. Moreover, education quality appears to have a direct monetary reward on the labour market irrespective of any return for higher educational attainment.

Returns to schooling

Indepth analysis of the wage and employability premiums associated with different educational levels among Black Africans and at the national level between 1994 and 2010, is presented in Branson and Leibbrandt (2013a), which was commissioned for this *Economic Survey*, and summarised in Annex A1. There are large differences in the size and trend of the wage premiums associated with different levels of education relative to the population that has only received primary education, which is mostly composed of Black Africans. Both the earnings and employment probability premiums to tertiary are very high (the Mincer return to tertiary schooling is around 18% while international estimates generally range between 6 and 14%) and have increased over the period. As shown in Figure 5, incomplete secondary and matric earnings premiums are respectively close to 6 and 11%, and they have stayed at constant levels over the period. These patterns suggest increasing, rather than decreasing, returns to schooling as in several other emerging economies (see Colclough *et al.,* 2010).

Returns to education are significantly lower for Black Africans relative to the national average, which may be linked to differences in school quality and persistent discrimination. The wage premium is lower for African males at any educational level but above all for those with a matric (Figure 5).

Figure 5. Returns to schooling, 2010 – Males



Source: Branson and Leibbrandt (2013a).

Labour market returns to school quality

Levelling out standards in school quality can have large impacts on individual's prospects on the labour market. First, school quality can affect educational achievement. Case and Deaton (1999) find that decreasing the pupil/teacher ratio by 10 children improves average educational attainment by 0.6 years. Second, school quality, even controlling for education level, may affect workers' productivity and their ability to find or maintain a job.

The labour market returns in terms of wage and employability premiums of school quality are investigated in Branson and Leibbrandt (2013b), which was commissioned for this *Economic Survey*, and briefly described in Annex A2. The authors merge income and employment panel data (National Income Dynamic Study) with historical education data from the Department of Basic Education. The sample is composed of prime working-age African adults (aged 32-59 years in 2008) who have completed their education before the end of apartheid. As mobility of Black Africans was largely restrained at that time, this population group was exposed in an exogenous way to different levels of school quality, which varied substantially across communities. Variables are constructed to proxy the degree of school quality observed in the respondent's school during youth. As the latter is not observed, the authors select the pupil-teacher ratio of the closest high school in the place of living of the respondent. Branson *et al.* (2012) find that over 70% of South African learners in 2008 attend either their closest school or a school within 2 km of their closest school. Finally, when regressing log earnings on pupil-teacher ratio, educational attainment and age, the authors also control for a large set of additional variables such as marital status, parental education, urban residence and a full set of dummies for the district council of birth capturing unmeasured characteristics at the district level.

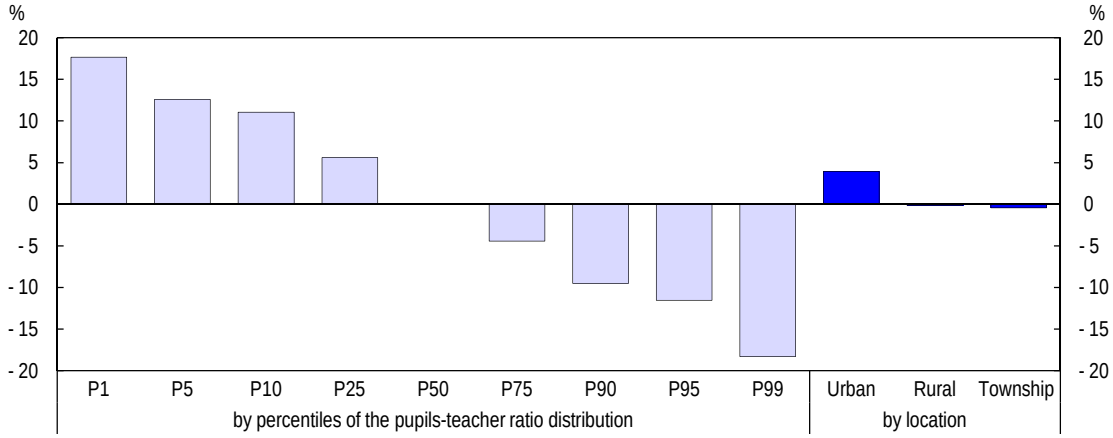
The pupil-teacher ratio is found to have a direct and large positive effect on the earnings of Black African males. On average, decreasing the pupil/teacher ratio by one learner is associated with about one percent increase in earnings. Moreover, the relationship between earnings and school quality appears to be stronger among those with only primary education. One possible reason is that, in a good quality school, those leaving with primary education still manage to achieve a basic degree of literacy and numeracy, while those in poor-quality schools are illiterate and or innumerate.

No robust relationship was found with employment. The less apparent relationship between employment and school quality and its strong association with earnings could signal that the difference in school quality is differentiating workers' skills in ways that are not immediately evident to an employer, but materialise once the individual is employed.

The magnitude of the estimated effect of the pupil-teacher ratio on earnings is further illustrated on Figure 6. The earnings premium paid to school quality is calculated for different quantiles of the current distribution of pupil-teacher ratio, and by location (the data were extracted from the Department of Basic Education, 2009a, S*ystemic study at grade 9*). The results represent the relative wage gap among adults that is associated with differences in school quality. It turns out that studying in a school of the bottom decile (*i.e.* with a pupil-teacher ratio below 20) would imply at least a 10% wage gain relative to future earnings of a pupil attending a school with a median pupil-teacher ratio (*i.e.* 28.1 in this database). Similarly, attending a school of the upper decile (*i.e*. with ratios above 35.7) is associated with at least a 10% wage penalty.

Figure 6. Labour market outcome of schooling quality

Relative wage variation due to differences in the pupil-teacher ratio



Source: Branson and Leibbrandt (2013b) and OECD calculations.

Improving education quality

Education quality, as measured for instance by students' average performance in test scores, depends on the amount of resources injected into the education system as well as on institutional settings that condition the efficient use of available resources. Both aspects are reviewed in this section. The adequacy of school outcomes to labour market needs is discussed in a third part.

The education system is missing physical and human resource

In the following section, the budget of the basic education system is evaluated against international standards. There is evidence of physical and human resource shortages, as well as unequal distribution of available resources.

Basic education is lacking resources

In 2010, public expenditure on educational institutions and administration represented 5.9% of GDP. About 2.5% of GDP were spent on primary education, 2.0% on secondary, 0.64% on tertiary, and 0.06% on pre-primary. Expenditure as a share of GDP was slightly higher than in Mexico and about the same as in Brazil or an average OECD country (World Bank, 2012). These figures are often quoted to make the point that there is no apparent under-funding of the education system. However, this view is inaccurate as the proportion of the population aged 0-14 years in South Africa (29.9% in 2011) is much higher than in OECD countries (*e.g.* 18.4% in France and 20.1% in the United States). This share is somewhat higher than even some other emerging countries, such as Brazil (25.0%). Even more strikingly, half of the South African population is less than 24 years old, many of whom should be attending an educational institution.

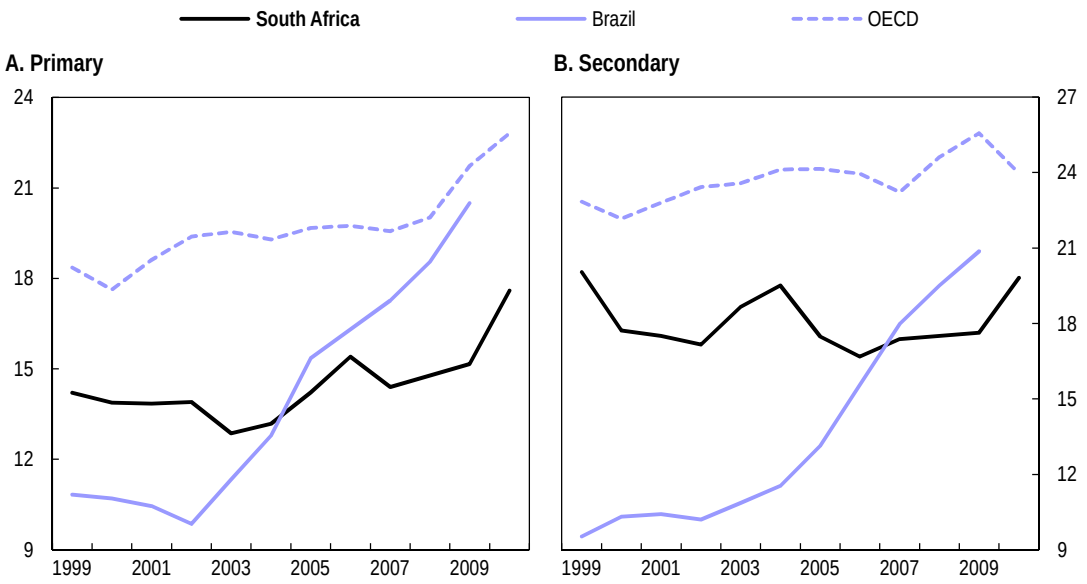
Public resources spent per pupils would need to be increased by 30% at the primary level and by 20% at the secondary level to match the OECD average level of resources per pupil. In this calculation, public spending per pupil is expressed as a share of GDP per capita, a proxy for cross-country differences in income standards. As shown on Figure 7, resource intensity has increased slightly in South African primary schools since 2003, but it has stagnated in secondary schools. This observation does not conflict with the fact that expenditure per student has substantially increased since the end of apartheid, but underlines a stagnation relative to productivity and wage gains realised over the period.

The gap in per capita learner expenditure across provinces has been reduced over the last decade. In 2007 expenditures per learner ranged between ZAR 5 029 in Limpopo and ZAR 7 381 in Free State, with a national average at ZAR 5 787 (OECD, 2008). In part this trend is due to a significant improvement in funding equity both between provinces and schools thanks to the implementation of redistributive policies (see below).

The most pressing problems perceived by students concern, by order of priority, the lack of books, high fees, large class sizes, poor teaching and teacher absenteeism (Statistics South Africa, 2011, Table 4). These issues have been repeatedly emphasised in the past. Lack of books and large classes are more common in the province of North West, while high school fees have mostly concerned Gauteng, Western Cape and Mpumalanga. On the other hand, teachers generally point to perceived lower wages and poor benefits, work overload and disintegration of student discipline (OECD, 2008).

Figure 7. Primary and secondary resources

Public expenditure per pupil (% GDP per capita)



Source: World Bank (2012).

The government has made several sets of recommendations to address these weaknesses (Box 2). While the most pressing concerns have been well identified, thanks to an impressive collection of data in the form of surveys and analysis conducted by administrative federal authorities over recent years, increases in allocated budgets have not always materialised on the ground, according to the Action Plan to 2014 (Department of Basic Education, 2011b), due to a lack of administrative capacity at the local level.

Box 2. Key priorities identified in National Development Plan, Action Plan to 2014 and the New Growth Path

The National Development Plan (National Planning Commission, 2012) makes the following recommendations to improve the education system:

- Achieve high-quality early education with an emphasis on child nutrition. Every child should receive at least two years of pre-school education.
- Improve education quality by upgrading the management of the system, with supportive and corrective measures targeting low-performing schools, and an infrastructure campaign in poor schools especially in rural areas. Improve the competence and capacity of school principals, emphasising a higher degree of selection among applicants, greater management powers and greater accountability.
- Improve teacher accountability. Issues related to teacher performance such as training, remuneration, incentives, teaching time and performance measurement are discussed.
- Expand the size and quality of the further education and training system, by improving the relevance of the curriculum.
- Increase participation and graduation rates at university for Black students and enhance R&D at university and in the private sector.

The Action Plan to 2014 (Department of Basic Education, 2011b) has the following 5 priority goals:

- Improve the access of children to quality Early Childhood Development (ECD) below grade 1.
- Improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire career.
- Ensure that every learner has access to the minimum set of textbooks and workbooks required according to national policy standards.
- Ensure that the basic annual management processes take place across all schools in the country in a way that contributes towards a functional school environment.
- Improve the frequency and quality of the monitoring and support services provided to schools by district offices, partly through better use of e-Education.

The New Growth Path (The Economic Development Department, 2010) has several quantitative objectives:

- Engineers and artisans: Target 30 000 additional engineers and 50 000 additional artisans by 2014-15.
- Workplace skills (SETA): Improve skills in every job and target 1.2 million workers for certified on-the-job skills improvement programmes annually from 2013.
- Further education and training (FET): Expand enrolment at FET colleges, targeting a million students in FET colleges by 2014 up from 420 000 in 2008, and increase graduation rates.

Upgrade existing school infrastructure and equipment

Although some progress has been made, many schools from disadvantaged areas still suffer from important infrastructure backlogs, which have largely been inherited from the apartheid regime. Thanks to a proper registration of needs and current backlogs through the National Education Infrastructure Management (NEIMS), the number of schools without water or without toilets has been divided by 5 between 1996 and 2010 (Action Plan to 2014, Department of Basic Education, 2011b, p. 152), and the number of overcrowed classes (over 45 learners) declined from 55% to 25%. Yet, provision of school infrastructure remains a serious challenge as for instance 77% had no computer center, 60% had no library in 2010, 7% still had no water supply, and overall 23% were deemed to be in poor or very poor condition, among which two thirds were located in Eastern Cape and KwaZulu-Natal (Department of Basic Education, 2011b, p. 150, from NEIMS database).

The government implemented the Accelerated Schools Infrastructure Delivery Initiative (ASIDI) in 2009 which is aimed at upgrading infrastructure and increasing the availability of learning materials in targeted schools, such as schools without water, sanitation, electricity, fencing, schools with deficient construction and overcrowded schools. The projected cost of replacing all inappropriate infrastructures is estimated at ZAR 6 B (*i.e.* 0.2% of GDP), of which 90% is disproportionately allocated to schools in the Eastern Cape.

The persistent shortage of textbooks illustrates the practical problems faced by the South African government. Statistics from SACMEQ (2007) database show that only 36% of learners had access to their own mathematics textbook. The low textbook availability is the main reason why learners are not allowed to take them home. In Limpopo, 22% of schools that ordered textbooks received nothing in 2008 (Department of Basic Education, 2011b, p. 125), which mainly reflects delivery failures of local authorities. There seem to be fewer problems when procurements are made to schools for purchasing learning materials directly, while using funds from the department (Department of Basic Education, 2010b).

Several ICT initiatives, sometimes involving private companies, have been proposed in various strategic documents, as e-Education is recognised to be an important aspect of the modern economy with which learners need to be familiarised. Yet, backlogs are enormous in rural areas and cross-province disparities in ICT penetration at school are likely to be persistent. Indeed, while wealthy provinces such as Gauteng and Western Cape display excellent coverage, most provinces especially the Eastern Cape, Limpopo and KwaZulu-Natal, are still lagging far behind (*e.g.* 60% of schools have a computer centre in Western Cape versus only 10% in Eastern Cape).

The South African government has rightly sought to address school equipment problems, which appear to be crucial hurdles in raising education quality. For instance, Case and Deaton (1999) found a positive return to secondary school libraries when estimating outcomes. Oosthuizen and Bhorat (2006) show that schools performing in the upper deciles have greater access to facilities (*i.e.* book rooms, principal's office, copy rooms) as well as greater relative access to equipment, especially overhead projectors and desks. Bhorat and Oosthuizen (2008) echo these findings, especially with regards to desks (per learner) and other equipment such as photocopiers, libraries, and computers.

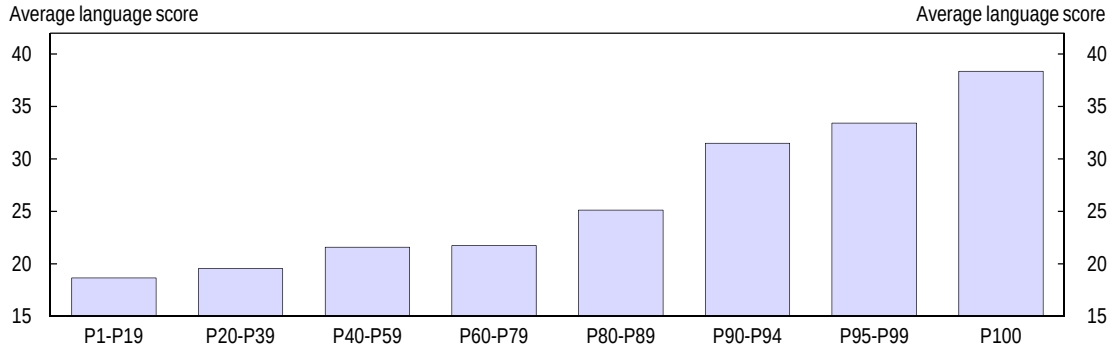
Evidence suggests a large and robust correlation between ICT and library availability and grade 9 pupils' performance in "Systemic Studies" language test scores in 2009 (Annex A3). Moreover, a very large number of other potential determinants (about 100) are included in the analysis in order to minimise the risk of any omitted variable bias. In this study, the set of explanatory variables includes learner characteristics (race, family wealth and socio-economic background, language spoken at home), school characteristics (physical and human resources, school climate, school principal characteristics), teachers characteristics and teaching policy (teaching intensity, assessment policy) as well as geographical controls.

In this analysis, learning-oriented school equipment stands out as a key lever for improving school outcomes. As expected, contextual variables such as the frequent use of language of test at home (*i.e.* Afrikaans or English), family wealth and some provincial dummies capturing unobserved province-specific characteristics (*i.e.* Free State having a large positive impact, and Limpopo a large negative one), display the largest effects. However, there are also large and robust correlations between test scores and policy variables such as ICT penetration or library availability at schools. For instance, the addition of library and ICT effects is commensurate to the effect associated with contextual variables such as the frequent use of the language of test at home or the constructed index of school historical and socio-economic background a weighted average derived from a Principal Component Analysis of variables such as the historical classification of schools, the amount of school fees, the quintile classification and school principal's assessment of pupils's socio-economic background.

Figure 8 provides a simple illustration of the relationship between reading test scores at grade 9 and a school equipment index, which is the weighted average of school infrastructure (materials used for walls, availability of running water, electricity and toilets), and use of libraries and ICT penetration. It is evident that test scores in the lowest-performing schools are half those in best-performing schools in proportion to the constructed school equipment index, with a marked increase in test scores among the top 10% schools in terms of school equipment.

Figure 8. Language scores

Average language score by percentiles of the school equipment use index



Source: Department of Basic Education (2009a) and OECD calculations.

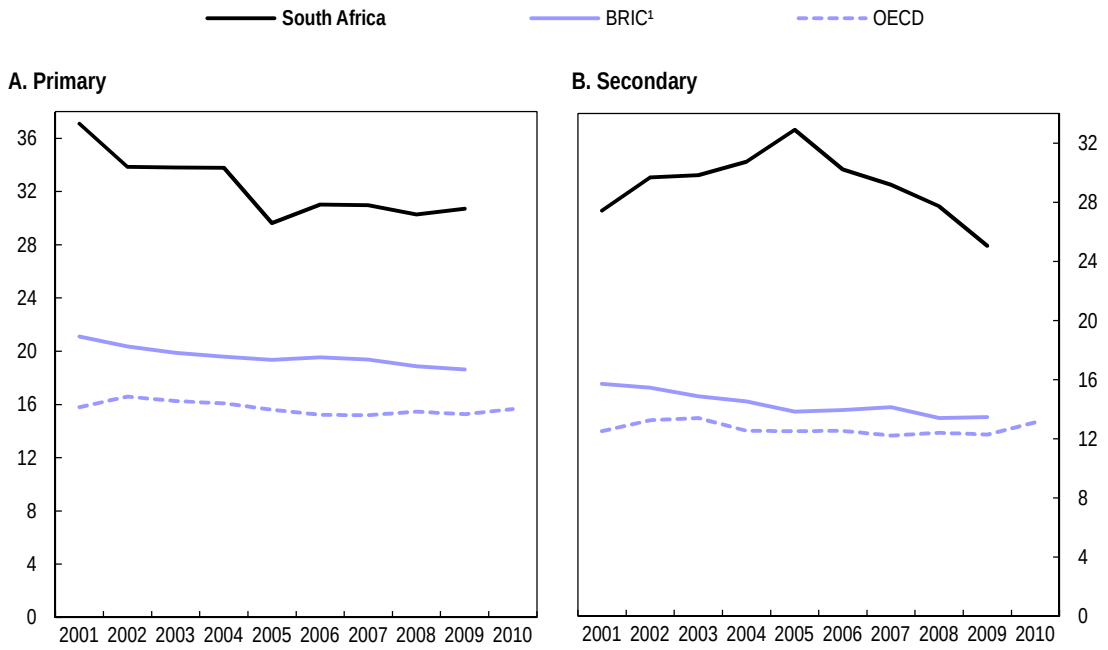
With these analyses in mind, it is strongly recommended that the South African government pursues and accelerates reforms to upgrade school infrastructure and equipment, while targeting basic school infrastructure (water, electricity), and learning materials (textbooks, libraries and access to ICT). While upgrading basic school infrastructure does not seem to have a significant impact per se (as already noted in several economic studies such as Crouch and Vinjevold, 2006), it is an essential first step before the introduction of additional equipment with stronger value-added such as libraries or ICT. To this end, the share of capital expenditure in total expenditure on public institutions should continue to rise: it increased from 1.1% in 2003 to 4.0% in 2009, but OECD countries spent on average 9.0% on capital at the same date, while Korea, the PISA leader, spent 16.8%.

Increase the quality and number of teachers

There is a severe shortage of good teachers in South Africa. Teachers' knowledge of the subjects they teach has been questioned in both regional tests (SACMEQ, 2007) and national surveys (Taylor *et al.*, 2012). Moreover, South Africa is confronted with a marked teacher shortage. The World Bank (2012) reports a pupil-teacher ratio of 30.7 in primary schools and 25 in secondary schools, almost twice the average level observed in OECD countries (among high-income OECD countries, the pupil-teacher ratio in primary ranges between 9.3 in Sweden and 22.0 in Korea, a country where teachers receive high wages and are deemed to be highly qualified, OECD, 2012d). While some progress has been made at secondary level, the ratio has stagnated in primary schools since the mid-2000s. Moreover, teachers are very unevenly distributed across types of schools. The Department of Basic Education (2011a) reports an average class size of 22 in independent schools, and 36 in public schools. The situation was even worse in FET Colleges and public higher education, where the pupil-teacher ratio was 58.9 and 48.2 in 2005 (OECD, 2008), although some adjustment may be needed to account for a relatively smaller number of hours taught. In 2009, the share of schools where average class size (which is always larger than the pupil-teacher ratio as some educators registered as teachers do not actually teach) was above 40 learners, reached 48% in Mpumalanga, 46% in Limpopo and 44% in KwaZulu-Natal. In comparison, average class size among OECD countries is 21 in primary schools and 23 in secondary schools (OECD, 2012c).

The lack of strong teachers is primarily a long-lasting consequence of the historical context, which has not been addressed successfully by the reform of teacher education. Each year, the number of teacher graduates is around 6 000, well below the replacement needs of approximatively 20 000. This critical situation is aggravated by the fact that about one fourth of newly qualified teachers, especially white teachers, plan to leave the country to teach abroad, and about half of new teachers have recently considered leaving the profession (OECD, 2008).

Figure 9. Pupil-teacher ratio



1. Brazil, Russian Federation, Indonesia and China.

Source: World Bank (2012).

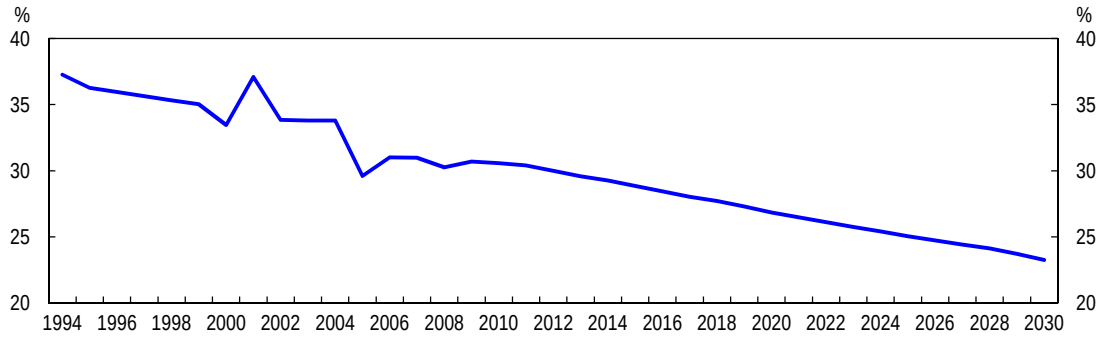
Among OECD countries, average class size is generally sufficiently low to be considered as a second-order issue. While teachers are usually available in sufficient quantity, upgrading teacher quality is a key policy objective recommended by the OECD (2012c). South Africa is facing both teacher quantity and quality issues, which both need to be addressed. As a first step, remedying excessively large class size would be conducive to improvements in education quality. In the context of South Africa, a large number of studies has pointed at teaching dysfunctions in the context of excess class sizes (*e.g.* Crouch and Mabogoane, 2001; Simkins and Paterson, 2005; van der Berg, 2006; De Lannoy and Hall, 2012), a finding partly confirmed by the empirical analysis of Annex A3.

Alongside other issues such as teacher quality and absenteeism that are addressed below, the South African government has rightly sought to address the teacher shortage problem. For instance, it put in place wage incentives representing as much as 10% of a starting salary in 2007 to attract teachers in rural and remote areas, and also implemented in 2007 the *Funza Lushaka* Bursary programme (see *www.funzalushaka.doe.gov.za* for details) to encourage students entering into the teaching profession. The bursary scheme covers all student expenses, including tuition, accommodation, meals and books and offers a small living allowance. The bursary is to be repaid if recipients fail to graduate or do not take up a post in a public school. This scheme has been very popular and has expanded rapidly. In 2010, about 9 200 bursaries were awarded and about 2 000 graduates were available for placement (Department of Basic Education, 2010a).

Such initiatives should be considerably strengthened to reduce the average class size in basic education, in particular in schools with a clearly identified lack of good teachers. First, the flight of the best teachers abroad should be contained by the provision of adequate incentives and career prospects. Moreover, South Africa may benefit from its relatively higher prosperity to benefit from an increasingly integrated teacher job market, by hiring Indian or African (*e.g.* from Lesotho, Zimbabwe, Zambia) teachers (SACE, 2011). Finally and most importantly, the expansion of the *Funza Lushaka* Bursary programme, which is planned to grow by 30% in 2013, should be fostered. This programme is deemed to be successful as it has lead to the training of good quality new teachers. Multiplying the size of this program by 10 would cost an additional ZAR 3.6 B or only 0.12% of GDP, and would cover the annual replacement need for teachers (about 20 000).

Although the South African government is encouraged to go beyond targeting replacement needs, just maintaining the number of teachers would halve the gap in pupil-teacher ratio in primary with respect to OECD countries by 2030 as the school-age population falls (Figure 10).

Figure 10. Projected pupil-teacher ratio



Source: OECD calculations based on constant number of teachers.

Make the distribution of school resources more equitable

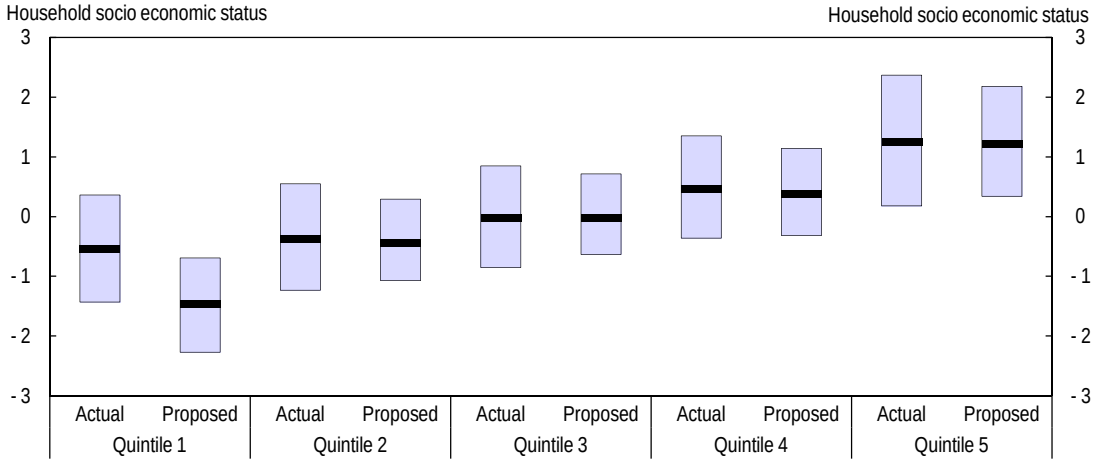
Inequality in school performance in South Africa has been largely driven by the socio-economic differences in parental background. Social Economic Status (SES) of parents is correlated with child test scores in all PISA countries, but the relationship appears to be stronger in South Africa. While parental SES explains about 13% of the variance in PISA test scores, it explains 20% in the *Systemic Study* analysed in Annex A3, and 22% when an index of school (rather than pupil) socio-economic composition is considered.

The impact of pupils SES on test scores is mitigated by redistributive policies such as National Norms and Standards for School Funding (NNSSF),[3] but it is amplified by the possibility given to School Governing Bodies to charge school fees. The NNSSF framework yielded a classification of schools according to national quintiles based on income, dependency ratio, the unemployment rate and the level of education of the community in the area around a given school. Funding for non-personnel expenditures are allocated such that the poorest quintile receives 30% of the total school allocation and the upper quintile only 5%. The school classification into quintiles and the associated public funding are determined by the average wealth of relatively large communities, and there remain stark differences in school funding within the same community as many schools are allowed to charge fees.

In other words, the current quintile classification of schools is inaccurate as it is based on crude geographical criteria, and it should be replaced by a different and fairer classification based for instance on the median learner's SES within each school (or possibly on any other quantile SES, depending on social preferences). To illustrate this point, an index of learners' parental SES has been constructed from the learner questionnaire of the *Systemic Study* as a weighted average (derived from Principal Component Analysis) of the following household characteristics: household size, orphan dummy, education of mother and father, reading frequency at home, books availability at home, dummies for household having electricity and a list of dwelling equipments and meal frequency of learner. Figure 11 compares the distributions of parental SES by school quintile, using alternatively the actual school classification and the one based on median learners' SES. Obviously, these calculations are only illustrative as the survey does not contain all learners at schools. Yet, it is striking that the proposed reclassification of schools would largely allocate most disadvantaged learners to quintile 1, contrary to the current quintile system that does not yield a proper stratification of schools with respect to the social background of learners especially in quintiles 1, 2 and 3 that are almost identical. Moreover, in the proposed reclassification each school quintile would be somewhat more homogenous in terms of pupils social background as shown by the lower distance between percentiles 75th and 25th in quintiles 2, 3, 4 and 5.

3. Another institutional setting, the Equitable Shares Formula (ESF), focuses on inter-provincial equity. The ESF, which was phased in from 1996 and 2000, calculates the allocation of budget to provinces based on variables such as the size of the school-age population, the number of learners enrolled in public ordinary schools, the distribution of capital needs, the size of the rural population in each province and the size of the target population for social security grants weighted by a poverty index.

Figure 11. Stratification of pupils socio-economic status



Note: The upper side of each box represents the percentile 75th of the distribution of pupils' parental socio-economic status within each school quintile, while the lower side represents the percentile 25th. The dark line at the center of each box indicates the median.

Source: Department of Basic Education (2009a) and OECD calculations.

In a few years, the "Information Tracking System" will provide an accurate assessment of schools' socio-economic composition, and will allow for a review of schools classification by quintile based on learners SES, rather than on geographical location as is currently the case. Under this framework, progressive school funding will be well targeted and should be implemented as soon as possible. In the mean time, the South African government is right to consider providing equal school funding for all no-fee schools, which almost coincide with schools from the first three quintiles, as pupils' parental SES is not very different across the latter three quintiles. However, the transition towards a truly progressive school funding system based on representative school quintiles should resume rapidly in order to target most disadvantaged schools in an effective way.

Finally, the existence of school fees in high-SES schools prevents the equalising mechanism described above to work at full strength. The education system remains dualistic with on the one hand a small number of former White schools that can collect tuition fees to supplement teaching and other resources, and on the other hand "no-fee" schools that rely entirely on government funds, do not have enough teachers and generally perform poorly, as shown for instance by the positive relationship between school average performance and school equipment (Figure 8). School fees are only 7% of all school resourcing, but in the *Systemic study at grade 9 Survey,* they constitute as much as 45% of top quintile school' budget, versus 2% for quintiles 1 and 2, and 16% for quintile 3.

While school fees have been a way for the government to substitute private for public funding,[4] the dualisation of the education system has motivated the introduction of "no-fee schools" in 2007. The share of pupils in "no fee schools" has increased markedly in recent years to reach 69% in 2010, versus 40% in 2007 (Department of Basic Education, 2010a). This is a remarkable progress, which has nevertheless only concerned schools relying relatively little on school fees. Any further expansion of the no-fee school policy would be much more costly, especially so if additional public funds would fully compensate foregone school fees in relatively wealthy schools.

4. Fee-charging schools are subsidised by the government for each disadvantaged child exempted from paying fees, but the subsidy is typically much less than the fees charged to other students, This creates problems as parents who pay fees complain about subsidising children from poorer background and exert pressures on School Governing Bodies, especially in ex-white schools, to regulate access by means of escalating school fees or school language policy.

From a long-term perspective, the South African government is encouraged to continue raising the number of no-fee schools in a gradual way, while substituting public for private resources to avoid a collapse of the best-performing schools and a massive flight to private schools. Over the short-term, the phasing-out of school fees could be postponed considering other important issues such as fiscal consolidation.

Increase cost-efficiency through better leadership, accountability and learners support

Improve governance and leadership at the national, local and school levels

The South African education system has been largely decentralised since the South African Schools Act of 1996, which devoted significant powers to School Governing Bodies (SGBs). SGBs include the school principal and elected representatives of parents, teachers and, in secondary schools, students. It is widely recognised, including in a Ministerial Review (cited in OECD, 2008), that SGBs have functioned unevenly due to skill gaps and unequal managing capacities between African and ex-white schools. In particular, provincial authorities still do not have the regulatory power to appoint school principals independently from SGBs recommendations, and cannot dismiss failing school principals, except for serious misconduct.

While greater decentralisation is a desirable objective, it was arguably implemented too early in South Africa given the dysfunctions of SGBs as well as poor local administrative capacity of visiting schools on a regular basis as recalled in the Action Plan to 2014 (Department of Basic Education, 2011b, p. 171). Empirical evidence clearly emphasises that decentralisation and the move towards greater school autonomy do not yield good outcomes when the accountability system is not functioning well, and when local authorities have low capacities (OECD, 2010a). For instance, simple cross-section regressions of average PISA test scores on the degree of school autonomy (which includes funding and/or curriculum autonomy) reveals a strong correlation among countries with developed accountability systems (proxied by the scope of school external inspections, or the use of objective criteria for teacher evaluation) and no correlation among low-accountability countries. Similarly, Hanushek and Woessmann (2013) use panel data evidence on school decentralisation reforms and show that the latter have been conducive to better educational outcomes only among higher-income countries, which have arguably had more experience in designing effective accountability and evaluation systems along their process of educational expansion.

From this point of view, the human and physical resources devoted to the recently-created National Education Evaluation and Development Unit (NEEDU) could be bolstered, as the latter independent team has received the mandate for auditing all levels of the education system in a vertical way (*i.e.* from national to provincial, district, school and teacher-level effectiveness), thereby assessing the degree of coordination among all decentralised members of the country's education system. In years to come, this unit may have a strategic role in designing forthcoming educational reforms based on its ongoing assessment, which should be looked at closely.

Such vertical analysis of the education system is clearly strengthened by the regular implementation of universal and verification Annual National Assessments, first run in 2008, and by the requirement for school leaders to provide school development plans. School principals have also expressed interest in participating in local networks to exchange views on management and pedagogical issues (Taylor *et al.*, 2012). These are crucial innovations that should be nurtured to identify best practices, detect under-performing schools, and improve school leadership (see Box 3 on management instruments).

Box 3. Management instruments to improve school governance

Several management instruments are available at the school level:

- *School improvement plan*: each school principal is required to update a school improvement plan annually. In 2008, only 60% of primary schools had a plan, versus 79% overall.
- *School timetable*: 7% of schools did not have a timetable in place according to Integrated Quality Management System (IQMS) monitors.
- *Daily teacher attendance register*: 17% of primary schools did not have updated registers.
- *IQMS instruments* (see teacher evaluation section): teacher capabilities are evaluated on the basis of self-appraisals, peer-reviews as well as appraisal by a manager of the school. Each school is currently supposed to fill the following IQMS forms: *i)* appraisals for each teacher; *ii)* teachers' personal growth plan; *iii)* school summary score sheet; and *iv)* internal moderation sheet reflecting on differences between personal and peers appraisals. Only 7% of schools visited have fully implemented the IQMS framework.
- *Annual report*: all schools are required to produce a report reflecting on progress made as envisaged in the school improvement plan. Stronger emphasis on this report is planned in the future.

Furthermore South-African based and US evidence shows that strong school principals can have a dramatic positive impact on school performance (Branch *et al.,* 2012; Taylor *et al.*, 2012). Similarly, strategies focusing on school leadership are viewed in a very favourable way to improve school outcomes in disadvantaged schools among OECD countries (OECD, 2012d). Moreover, principal-based strategies are likely to be cost-efficient, as they only require additional resources for a relatively small number of school leaders (about 25 000 in primary and secondary, or 20 times less than the number of teachers). PISA countries with strong school leadership spend available resources more efficiently than other countries, namely they maintain a positive correlation between school outcomes (test scores) and expenditure.[5]

School principals' management capacity should be upgraded by increasing participation in the university-based Advanced Certificate of Education (ACE) programme. Moreover, school principals should be appointed after a selective examination process, which would be possible only if the pool of applicants was sufficiently large. To attract highly skilled applicants, wages should be competitive at the national level and additional administrative staff support could be offered.

In turn, school principals should increasingly become accountable for the dynamics of schools' Annual National Assessments, and for the adequacy of their teachers' ratings in the face of audits by external inspectors (see below). Under current institutional settings, the authorities do not have the regulatory power to dismiss the principal of a school where education outcomes are rapidly deteriorating or where serious dysfunctions have been observed. It is therefore crucial that national or competent provincial authorities be available to appoint and/or dismiss school principals in a more flexible way, without School Governing Bodies being able to obstruct the final decision.

5. This observation is irrespective of OECD membership and of the normalisation of total education expenditures by GDP per capita.

Increase teacher monitoring, simplify their evaluation and improve training

Poor teacher quality has been a serious problem, especially in rural areas, where teachers have been reluctant to be redeployed, and as a result, many of the best qualified teachers have left the profession, or have joined fee-paying schools in affluent communities (OECD, 2008). While significant improvements in the administrative qualification of teachers have taken place since 1994, they have had no impact on learning outcomes, which questions the value of these qualifications (Department of Basic Education, 2010a). As already mentioned above, teachers' cognitive capacities have been put in doubt by the results of formal tests in *SACMEQ 2007 Study* and national surveys (Taylor *et al.*, 2012).

Beyond cognitive skills, low contact time with children or high absenteeism has been a recurrent problem (Spaull, 2012). Many teachers are often late at school, are frequently absent on Fridays, and spend little time on-site. OECD (2008) reports that teachers spend only 46% of their time in teaching, while a 70% proportion would be expected on the basis of practice in other countries. Moreover, HIV/AIDS has been a serious concern as about 13% of teachers are HIV-positive (Department of Basic Education, 2010a).

The South African government has decreed many reforms in the area of teachers' accountability, but teacher absenteeism still needs bolder action. Addressing teacher absenteeism could be facilitated by the provision of additional administrative staff dedicated to teacher monitoring. Indeed, recent evidence shows that only 17% of schools maintain up-to-date daily educator attendance registers (Department of Basic Education, 2011b, p. 137). The South African government has the authority to sanction persistent teacher absenteeism by proportional wage cuts. This should be enforced on the basis of updated daily attendance registers. In particular, any fraud in teacher daily attendance registers observed by external inspectors should be detrimental to the administrative staff and school principal, in the form of monetary and/or disciplinary sanctions.

Regarding teachers' wage incentives, it is important to note that the teacher's income distribution is a tightened version of the national income distribution, which means that low-skill teachers are better off than low-skill South-Africans, but that high-skill teachers are worse off than high-skill South-Africans (van der Berg and Burger, 2010). Consequently, the South-African government is rightly considering to align the two above income distributions, first by hiring low-skill primary teachers, who should nevertheless be qualified enough to teach in Foundation Phase, and secondly by introducing wage increases for the best teachers who pass formal examinations of subject knowledge (Department of Basic Education, 2011b). Such increases should be applied in a very selective way to ensure cost-containment of the teacher wage bill, and should target best teachers working in disadvantaged and remote areas, which are the most affected by strong teacher shortage.

Arguably, teacher evaluation could be simplified. The Integrated Quality Management System (IQMS) has been criticised for being too complex and bureaucratic given implementation readiness of a majority of schools (De Clerq, 2008), while the relevance of teacher self-appraisals and personal growth plans in the teacher evaluation process is not striking. In fact, 20% of teachers did not participate in the process in 2009, and only one third of all schools were visited by "moderators" from IQMS. Possibly, evaluation could rely more heavily on school principals' assessments, and periodic external evaluations. While different evaluation models are in place among OECD countries (OECD, 2009a), evaluation based on standardised tests of students do not seem to be adequate given marked social disparities in the country, and the difficulty of properly assessing teachers 'value-added'. This *modus operandi* could perhaps be introduced at a later stage.

Assessing the performance of educational actors ultimately serves the purpose of improving teaching quality in the classroom. As explicitly recognised in the Action Plan to 2014 (Department of Basic Education, 2011b), maintaining the right balance between teacher monitoring and support is essential.

Training is the usual way of improving the performance of poor teachers. At the moment, 70% of development activities take place in education departments, while teacher unions, NGOs and universities have also been involved. Regarding training content, the National Education Evaluation and Development Unit is rightly emphasising subject knowledge. Certificated training programmes taking place at university would seem advisable in that regard.

The Action Plan recommends that each teacher follows 80 hours of professional development activities per year, in line with common practice among OECD countries (OECD, 2009b). A new monitoring system run by the South African Council for Educators (SACE) is envisaged to ensure that teachers undertake a sufficient degree of development activities over several years. While ensuring a sufficient quantity of training is a desirable statistical objective, training quality should be the main focus, with the most successful training programmes, such as those taking place at university, being expanded.

It is worth mentioning that the South African government has undertaken a 'Teacher Laptop' initiative, which aims at fostering distance education and training for teachers. As this measure is likely to yield efficiency gains, it is much welcome and in line with a past recommendation from the OECD 2008 *Education Review* (OECD, 2008).

Finally, teacher peer reviews and teacher local networks are strongly encouraged (OECD, 2009b), as they are deemed to foster the local diffusion of good pedagogical practices. This direction of reform is mentioned in the Action Plan, but practicalities remain to be discussed.

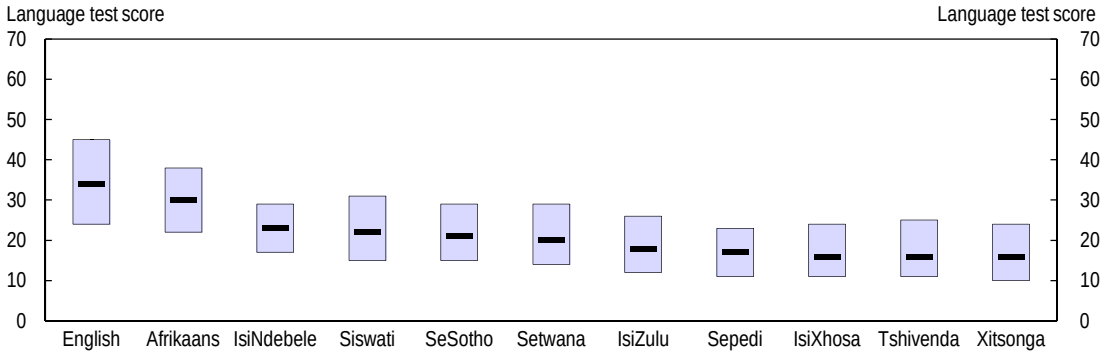
Strengthen core curriculum for disadvantaged learners

Curriculum reform has been unprecedented in sense of scale, substance and style over the last fifteen years (OECD, 2008). A new curriculum known as Curriculum 2005 was launched in 1997. The new curriculum was successfully implemented by historically white schools, but it widened the gap with disadvantaged ones. Following the 2009 curriculum review (Department of Basic Education, 2009b) it has been and will again be simplified. The South African government has rightly sought to adapt the curriculum to existing disparities in resources by giving more emphasis to basic skills in primary schools. The efforts of the government towards better achievement in basic skills could be strengthened by increasing the number of teaching hours in language and mathematics courses among no-fee schools.

Repetition is still high, especially at grades 1, 9, 10 and 11, and should be avoided as it discourages learning. Eliminating grade repetition is actually a major recommendation to foster equity among OECD education systems (OECD, 2012d). South Africa could follow the example of Finland, in which support groups are set up at school to make sure that pupils experiencing difficulties do not fall further behind (OECD, 2012d). Similarly, support teaching should focus on basic skills.

In addition, multi-lingualism is an important contextual difficulty as there is widespread evidence that pupils with an African mother-tongue perform significantly worse in English than Afrikaans speakers. Figure 12 reports the distribution of language scores (English or Afrikaans) from the 2009 systemic study at grade 9 by type of mother-tongue. The upper side of each box represents the percentile 75th, the lower side the percentile 25th, and the black line in the middle of each box indicates the median language test score.

Figure 12. Language test score



Note: The upper side of each box represents the percentile 75th of the distribution of pupils' language test score by language spoken at home, while the lower side represents the percentile 25th. The dark line at the center of each box indicates the median.

Source: Department of Basic Education (2009) and OECD calculations.

Addressing multi-lingualism would require to familiarise learners with English since grade 1 if possible. At the same time, the switch to English as a main language of instruction at grade 3 appears to be highly confusing for unprepared African learners. Ideally, those pupils should be exposed to English in a gradual rather than abrupt way. Strengthening the early teaching of English in most schools would seem a desirable first step, especially in African language schools and at (pre-) primary school level. For instance, only 1% of African language learners study English in grade 1. To that aim, expanding the recruitment of English teachers from other (English-speaking) countries such as India or other African countries would be helpful to address pressing and immediate teacher shortages. Regarding the language of instruction, the 'Foundations for Learning' programme, launched in 2008, emphasised the importance of the use of mother-tongue language during the first three years of schooling, a condition that is met by 80% of learners in Foundation phase. The *2009 Annual Survey of Schools* indicates that, at grade3, about 70% of learners are taught in an African language, a percentage that drops to 8% at grade 4 (Department of Basic Education, 2011b). In practice, this abrupt switch to English at grade 4 constitutes a very difficult transition for learners and it could take place in a gradual way or occur subsequently, in line with international practices (OECD, 2012e).

Repairing skill supply and demand mismatch on the labour market

While basic education reforms are necessary to strengthen the education system and increase the general skill level of the population, further reforms of vocational and tertiary education should seek to address high youth unemployment.

Increase the demand for vocational education

High youth unemployment highlights the issue of skill deficiencies among those who fail to pass the matric exam and reach higher education. From that perspective, the vocational education and training system, mostly composed of Further Education and Training (FET) colleges and Sector Education and Training Authorities (SETAs), appears to be underdeveloped and ill-functioning (OECD, 2008). Public FET colleges accommodate about half a million students while private colleges accommodate about one million students (Lolwana, 2009). Hence, public FET colleges represent less than 10% of pupils enrolled at secondary schools, and display by far the highest pupil-teacher ratios in the education system, although lower teaching time per student in FET colleges may bias the comparison. In practice, technical colleges are characterised by high churning rates as students face important credit constraints and often drop out. The Department of Higher Education and Training (2012, p. 22) reports dropout rates of between 13% and 25%.

South Africa has undertaken important reforms of the VET system, in close connection to the 'Accelerated and Shared Growth Initiative - South Africa' (AsgiSA) economic strategy. The key target has been to expand the sector substantially, which is taking place at a reasonably high pace. To this aim, FET colleges have been recapitalised across all provinces, with the objective of upgrading classrooms and staff quality (OECD, 2008). Moreover, the National Skills Strategy III (Department of Higher Education and Training, 2011) introduces a well-articulated development plan. Focusing on a specific part of the vocational system, the expansion of the apprenticeship system, may constitute a useful tool to reduce youth unemployment. Restoring an effective apprenticeship system is an explicit goal of the New Growth Path, which plans for the formation of 50 000 additional artisans by 2014-15.

Successful VET systems in OECD countries, such as the Austrian and German models, often present the dual characteristics of allowing a connection to higher education, which raises the quality of new entrants, and of offering a strong connection to the labour market thanks to up-to-date curriculum in tune with labour market needs (OECD, 2010b, 2012d).

As a first step, the South African government should strengthen the link between FET colleges and university. In Austria, which has a successful vocational system, the transfer rate from VET graduates to university was 35% in 2008 (OECD, 2010), but in South Africa, only 15% of college students are able to make the transition towards university (World Bank, 2011).

Moreover, some universities are reluctant to recognise credits from these diploma and obstruct the pathways from post-secondary non-tertiary vocational programmes to higher education (Perold *et al.,* 2012). A tighter connexion to higher education would raise the quality of applicants to FET colleges, as the self-selected pool of students in vocational education is often considered to be of lower quality since it encompasses mostly students who were not able not complete the general education cursus.

Furthermore, there is low demand from firms to students graduating from vocational institutions as the curriculum is largely perceived as being outdated (Gewer, 2010). National curricula for vocational programmes have been introduced in 2007, and further reforms are planned in consultation with the business sector. In that regard, the establishment of the South African Institute for Vocational and Continuing Education and Training (SAIVCET), which is to re-build a curriculum with the help of the business sector, is a welcome initiative.

Another way of raising the quality of the curriculum is to develop partnerships between large companies and public or private FET colleges. Indeed, companies invest funds to upgrade the quality of the college in exchange for conveying their views on how to tailor the college curriculum to match their specific needs. There are several anecdotal examples of such partnerships involving foreign companies. It is regrettable that large domestic firms do not engage more in such arrangements.

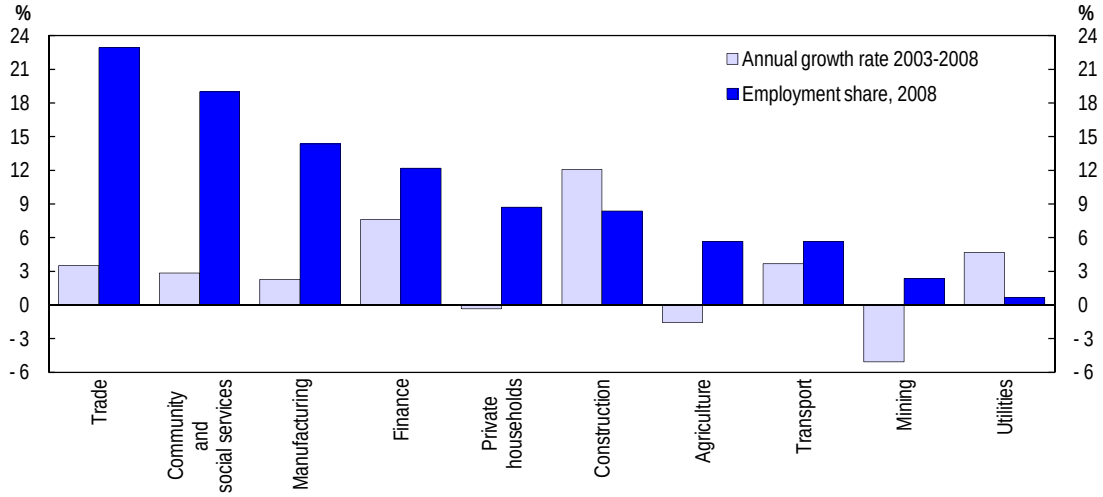
More generally, strong financial incentives for firms should be put in place to hire trainees from FET colleges. Such incentives could be in the form of tax credit or hiring subsidies for firms hosting the trainees following a vocational cursus in a FET college. At the moment, too little on-the-job training takes place for VET students, as 65% of them are unable to find workplace experience (Department of Higher Education and Training, 2012, p. 26). Training contracted between FET colleges and firms in the context of the vocational cursus concerns an even smaller number of students, about 5%. The integration of workplace training with theoretical training is a goal of the National Skill Development Strategy III, but the latter document does not make explicit the policy levers that would help attain that goal.

Trainees should be hired on a short-term and renewable basis under simplified administrative hiring procedures. While training conditions should comply to labour laws and offer basic working conditions, the current possibility offered to employers to stop training within 21 days after it has started is reassuring

as it allows employers to have some minimum influence over trainees' selection. Yet, employers have reported on time-consuming informal meetings with administration services of FET colleges, which could be streamlined (Quality Council for Trades and Occupation, 2011).

Finally, emphasis should be put on skills demanded by large and fast-expanding sectors. Figure 13 shows that trade, community and social services as well as manufacturing employ large fractions of the workforce and have grown at a steady 3% annual rate between 2003 and 2008. Construction and finance sectors are slightly smaller sectors but they have been growing rapidly over the same period. While the design of vocational fields should not necessarily stick to most recent economic trends that may change course unexpectedly, the VET system should seek to supply expanding economic sectors with enough technical workers.

Figure 13. Employment distribution and growth by industry



Source: Statistics South Africa (2012), *Labour market dynamics in South Africa*.

Alleviate credit constraints to raise enrolment at university

Tight credit constraints help explain why enrolment at university has been relatively low (18% of the population aged 18-24) despite very high returns to tertiary education. At the university level, tuition fees are high (about one average monthly wage or ZAR 8 000) and represent 25% of the higher education budget. Recent research conducted by Gurgand *et al*. (2012) has shown that access to loans from private banks significantly raises the probability to enrol at university. Moreover, Oliveira Martins *et al.* (2009), using panel data evidence, have identified the development of the loans and grants systems as a key determinant of the enrolment rate at university among OECD countries.

The South African government has implemented an income-contingent loan programme (NSFAS) targeted to the poor, which has been a mixed success: in 2009 about 48% of the higher education students that had borrowed from NSFAS had dropped out without completing their studies. As the latter programme is targeting students from lower social background, an additional incentive would be to waive the repayment of the loan in the case of graduating, as rightly envisaged by the South African government. For students with middle social background, a greater access to loans from commercial banks would constitute an alternative way of alleviating credit constraints. The government could outsource the management of a large number of income-contingent repayment schemes to private financial companies.

Box 4. Main education recommendations

Note: Recommendations already contained in OECD (2008) are displayed in italics.

Increase and equalise education resources

- Expand the ASIDI programme to address infrastructure backlogs and *improve the delivery of learning materials* (textbooks, desks, libraries and computers) with priority to the most deprived schools.
- Expand the *Funza Lushaka* bursary programme for teaching studies and allow more immigration of English teachers.
- *Expand the "no-fee school policy"* and *reclassify schools* according to median learners' socio-economic background rather than school location to improve the effectiveness of redistribution.

Strengthen the school leadership strategy

- *Provide more school leadership training and support staff in exchange for stricter accountability.* Allow the education authorities to appoint and dismiss school principals in a more flexible way (depending on progress on school performance in Annual National Assessments and on external reviews), while making school principals responsible for yearly teacher evaluations and monitoring teachers' daily attendance.
- Expand the school principals ACE programme to improve the quality of school management, and develop networks to exchange best-practice experiences among school principals. Maintain strong wage incentives to become a school principal, especially in rural and remote areas.
- Empower the independent federal evaluation unit NEEDU, join the Programme for International Student Assessment (PISA) and the Teaching and Learning International Survey (TALIS) and undertake an OECD *Review of Evaluation and Assessment Frameworks for Improving School Outcomes*.

Review teacher evaluation and training

- *Focus on teacher training* on low-performers and subject knowledge.
- Tie teacher wage increases to selective certificates completion rather than collective or external evaluations.

Adapt the curriculum to address socio-economic inequalities

- Expand the focus on basic skills in low-quintile schools and provide support to avoid grade repetition.
- Introduce English teaching earlier to prepare the learner to the switch to English as the language of instruction. The switch could be gradual or be postponed to a latter grade.

Remove credit constraints at the tertiary level and improve the VET system

- Discuss the participation of firms in the elaboration and review of the curriculum.
- Foster on-the-job training with tax credits and simplify administrative procedures for hiring trainees from FET colleges. Widen the scope for apprenticeship programmes organised by public-private partnerships.
- Expand the loan system by relying more heavily on private financial companies sub-contracted by the government.

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Annex A1

Educational attainment and labour market outcomes

This Annex presents the results from Branson and Leibbrandt (2013a), a paper commissioned by the OECD as background for this *Economic Survey*. Wage and employability premiums associated with different educational levels are calculated for different population groups. Seventeen years of national household survey data spanning 1994 to 2010 are used. The data is compiled from the *October Household Surveys* (OHS's) in the 1990s, the *Labour Force Surveys* (LFS's) between 2000 and 2007 and the *General Household Surveys* (GHS's) for 2008 through 2010. These are currently all the publicly available national household surveys that contain individual level earnings information in addition to individual and household characteristics. The Post Apartheid Labour Market Series (PALMS) version of the 1994-2007 data is used as a starting point and it is supplemented with GHS data in 2008, 2009 and 2010.

The initial model presented is a basic semi log linear wage regression with a quadratic in age (in single years) and education level dummies (the excluded group is those who completed only primary education). Age and age squared are included to account for age and experience since the high rates of grade repetition that characterise the South African schooling system and the high rates of unemployment, especially youth unemployment, limits the appropriateness of the traditional experience specification in the South African context. Formally the model is:

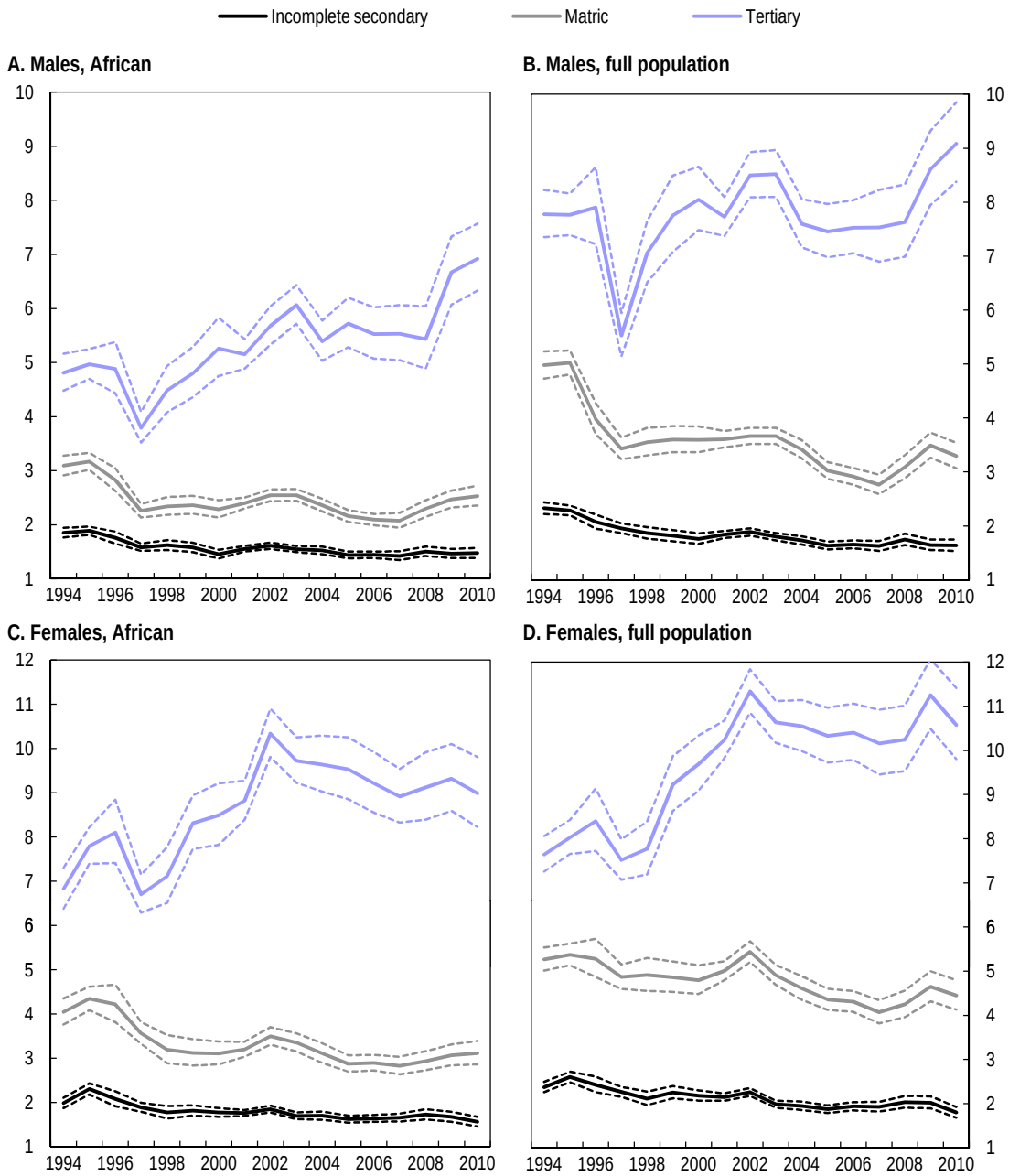
$$\ln(Wage)_i = \alpha_i + \beta_1 Age_i + \beta_1 Age^2{}_i + \gamma_1 IncSec_i + \gamma_2 Matric_i + \gamma_3 Tert_i + \mu_i \qquad (1)$$

where the dependent variable is the natural logarithm of monthly earnings in South African rand. The model is run for each survey year and an indicator of the month of the survey included for years with more than one survey. This specification is extended to include additional controls for marital status, number of children 0-6 in the household, number of children 7-17 in the household and number of working adults in the household, marital status, number of children and an indicator for urban residence where available (1994-2004). Separate models are run for males and females, and for Africans and total active population.

The results pertaining to education coefficients are reported in Figure A1. Estimated coefficients are converted to wage ratios with respect to population with primary only. For instance, the converted coefficient of 2.5 for Africans with a matric in 2010 means that the latter group earns 2.5 times the average wage of Africans who received only primary education.

As made evident from Figure A1, several results emerge: *i)* Premiums for each education level are higher at the national level than in the African group, which points to the existence of relatively higher returns among Whites, Coloured and Indians; *ii)* The tertiary premium in the national sample is very high while the African tertiary premium, while still high, is lower; *iii)* The premium for tertiary, however, has been increasing for Africans while it has remained more stable at the national level, except perhaps since 2008; and *iv)* Africans with tertiary education earned almost seven times what Africans with only primary education earned in 2010.

Figure A1. Wage ratio with respect to population with only primary schooling



Note: This graph presents the converted wage regression coefficients (and confidence bands) on matric (bottom line), incomplete secondary (intermediate line) and tertiary (top line) relative to primary or less obtained from a linear regression of log earnings, controlling for a quadratic in age, marital status, number of children and number of employed adults in the household as well as an indicator of urban residence when available. Converted coefficients = exp(b). All regressions weighted using the cross entropy weights.

Source: Branson and Leibbrandt (2013a).

Next the authors investigate the relationship between education level and employment probability. They estimate a linear probability model of the probability of employment given that the individual participates in the labour force:

$$Employed_i = \alpha_i + \beta_1 Age_i + \beta_1 Age^2{}_i + \gamma_1 IncSec_i + \gamma_2 Matric_i + \gamma_3 Tert_i + \mu_i \quad (2)$$

where the dependent variable indicates whether individuals in the labour force have any form of employment. The authors calculate the increased propensity to be in employment that incomplete secondary, matric and tertiary afford individuals over those with primary or less education graphically. The basic specification includes a quadratic in age, and the controls model supplements this with controls for coloured, Indian, white, married, divorced, widowed, number of children 0-6 in the household, number of children 7-17 in the household, number of working adults in the household and an indicator of urban residence when available.

As a result, once household and racial controls are taken into account, only the tertiary employment premium is statistically significant in all years. This means that only those with tertiary have an increased probability of being in employment relative to those with primary education in each year. Males with tertiary are about 10 percentage points more likely to be employed than those with primary. Females with tertiary are about 20 percentage points more likely to be employed than those with primary. The matric coefficient is small in most years and only significantly different from zero in a few years.

Annex A2

Education quality and labour market outcomes

This Annex presents the results from Branson and Leibbrandt (2013b), another paper commissioned for this *Economic Survey*. Measures of school quality are included in wage and employment regressions presented in Annex 1.A1. In practice, data from the National Income Dynamic Study (NIDS) are merged with measures of school quality extracted from the Schools Register of Needs and Department of Basic Education matric data on geographic proximity to complete the database.

To reduce the omitted variable bias and endogeneity concerns, the authors focus in the empirical analysis on a particular group, namely prime working-age African adults (aged 32-59 years in 2008) who would have completed their education before the end of apartheid. As mobility of Black Africans was highly restricted during the apartheid regime, allocation of Black African pupils at school may be viewed as exogenous.

Secondly, measurement errors in school quality may attenuate the estimates as the identity of respondents' school during youth is not observed. As a measure of school quality, the pupil/teacher ratio of the respondents' closest high school in place of living during youth is taken as a proxy for the quality of education in the respondents' school. Branson *et al.* (2012) find that over 70% of South African learners in 2008 attend either their closest school or a school within 2 km of their closest school. It is therefore not unreasonable to assume that the closest high school presents a likely option for most respondents, especially given residential restrictions at the time. A similar strategy has been followed by Case and Yogo (1999). As a robustness check, a different proxy for school quality based on the closest high school's pass rate at the matric is considered. Consensus in the US literature is that the measurement error and omitted variable bias are similar in size and cancel each other out (Hertz, 2003).

The empirical specification assumes a direct impact of school quality on earnings or employment:

$$Y_i = \alpha + \beta_1 incomsec_i + \beta_2 matric_i + \beta_3 tertiary_i + \gamma_1 SQ_{is} + X_i{}'\delta + \varepsilon_i$$

where Y_i is either an indicator of employment or the log of monthly wages, β_1 through β_3 are the coefficients on indicators of whether the respondent has incomplete secondary, matric or tertiary, with primary or no schooling as the reference category. SQ_{is} is a measure of the quality of respondent *i's* closest high school *s*, X_i is a matrix of control variables and ε_i is an individual error term. Control variables (X_i) include a quadratic in age, marital status, parental education and urban residence. Note, one would ideally want to control for differences in the mean characteristics of the area where the individual went to school to be assured that the school quality measures are not picking up differences in incomes arising from these differences (*e.g.* average educational level of adults, good health care, parents with jobs, etc.). Controlling for parental education goes some way towards dealing with this. In addition, a full set of dummies for the district council of birth is included to capture unmeasured characteristics of the district council.

As a main result, there is a significant relationship between school quality (be it measured as the pupil-teacher ratio or the matric pass rate) and wages, even after controlling for education level. This relationship is not a function of individual characteristics, parental education or other unobserved characteristics of the district council in which the respondent was born. The size of the coefficient actually increases with the addition of controls and the district council of birth fixed effects. A one pupil reduction in the pupil/teacher ratio results in a 1% increase in earnings.

There is less evidence of a relationship between school quality and employment than was seen between school quality and wages. As was found for the wage regressions, the size and significance of the coefficients on the educational categories are similar to national data analysis: only tertiary is found to have a significant effect on employment. The inclusion of the quality measure does not impact the education coefficients substantially.

School quality appears to play less of a direct role in determining employment than it does in determining wages. The matric pass rate is significant in all specifications, while the pupil-teacher ratio is significant only when it interacts with attained educational level variables. In this case, reducing the number of learners under the responsibility of one teacher by 10 learners improves the employment probability by 0.03.

Annex A3

The determinants of pupils tests scores at grade 9

This Annex presents joint work, soon forthcoming as an OECD working paper, with the South African Human Sciences Research Council (HSRC) on the determinants of pupils' performance in mathematics, language (English or Afrikaans) and science national test scores at grade 9 (Department of Basic Education, 2009a). The data set is built on seven questionnaires: three are administered to learners before they answer the language, mathematics and natural science tests respectively, three are answered by the teachers of the tested subjects and the last one is filled in by the school principal. There are three dependant variables, corresponding to the test scores in language, mathematics and science. To exploit the raw answers from the seven questionnaires, a preliminary stage of data consolidation was conducted to extract relevant information in the most efficient way. New indicators were created by regrouping questions dealing with a similar subject and by applying principal component analysis in order to construct a more manageable set of variables.

A large number of potential explanatory variables (about 100) is considered. A Bayesian algorithm allows to select the set of variables that are the most robustly associated with test scores among a high number of potential candidate variables. Remaining endogeneity concerns would ban strictly causal interpretation of the above results, but the high number of control variables and the severity of the Bayesian robustness analysis conducted on the data reduce the risk of endogeneity bias.

A Bayesian Model Averaging (BMA) framework is able to select the set of most robust explanatory variables. The goal of the algorithm is to find a subset of variablesX_γ that significantly affects the scores, *i.e.* to find the "best" relation with the structure:

$$y = \alpha_\gamma + \beta_\gamma X_\gamma + \varepsilon \quad \varepsilon \sim N(0, \sigma^2 I)$$

with y being the test score, α_γ a constant, β_γ the coefficients and ε a normal error term of variance σ^2. One possible approach is to start with the full set of possible variables (here very large), and to suppress non-significant terms, but this process is neither very robust nor efficient. BMA uses Bayesian theory to tackle this issue. The broad idea is to start with a prior on which model is the most likely and estimate a posterior probability applying Bayesian rule. If M_γ denotes the model with regressors X_γ, this posterior model probability (PMP) is, by Bayesian rule:

$$PMP_\gamma = p(M_\gamma | y, X) = \frac{p(y | M_\gamma, X) p(M_\gamma)}{p(y|X)}$$

As $p(y|X)$ is constant over models, the PMP is the proportional to the model prior $p(M_\gamma)$ times the marginal likelihood of the data given the model $p(y | M_\gamma, X)$. The idea of BMA is then to use these PMPs as weights to infer average posterior distribution of the coefficients:

$$p(\beta | y, X) = \sum_\gamma PMP_\gamma . p(\beta | y, X, M_\gamma)$$

Several different priors have been tested and deliver comparable results. Many variables have close to zero coefficients when they have negligible probability of inclusion. The magnitude of coefficients is assessed by calculating the change in test scores (as a share of the standard deviation of test scores) when increasing each variable by one standard deviation.

Regarding policy variables, school equipment is an important factor of learners' outcome. There are large effects associated with a library or ICT laboratories. Having a pupil-teacher ratio above 25 has a significant, negative and large impact in some regressions, but it is not selected as a robust variable by the algorithm. Other large effects were found for contextual variables such as provincial dummies, native language, parental literacy, good nutrition, and distance to school. It is worth noting that the above mentioned factors seems to explain most of the gap observed between population group, as the population effect (capturing other unobserved factors correlated with race) is rather weak, at least in language. There is no statistical link between qualification and training of personnel and learner outcomes, an unexpected finding that may be explained by measurement errors in the latter variables.

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