WP/19/47

IMF Working Paper

Struggling to Make the Grade: A Review of the Causes and Consequences of the Weak Outcomes of South Africa's Education System

by Montfort Mlachila and Tlhalefang Moeletsi

INTERNATIONAL MONETARY FUND

 WP/19/47

IMF Working Paper

African Department

Struggling to Make the Grade: A Review of the Causes and Consequences of the Weak Outcomes of South Africa's Education System

Prepared by Montfort Mlachila and Tlhalefang Moeletsi[1]

March 2019

Abstract

While South Africa has made significant improvements in basic and tertiary education enrollment, the country still suffers from significant challenges in the quality of educational achievement by almost any international metric. The paper finds that money is clearly not the main issue since the South Africa's education budget is comparable to OECD countries as a percent of GDP and exceeds that of most peer sub-Saharan African countries in per capita terms. The main explanatory factors are complex and multifaceted, and are associated with insufficient subject knowledge of some teachers, history, race, language, geographic location, and socio-economic status. Low educational achievement contributes to low productivity growth, and high levels of poverty, unemployment, and inequality. Drawing on the literature, the paper sketches some policy considerations to guide the debate on what works and what does not.

JEL Classification Numbers: I21, I24, I25, I28

Keywords: educational attainment, quality of education, education reforms, South Africa

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[1] We would like to thank, without implication, Mbali Buthelezi, Martin Gustafsson, Spencer Janari, Monique Newiak, Axel Schimmelpfennig, Edgar Sishi, Nelson Sobrinho, Stephen Taylor, Russell Wildeman, and participants at the African Department and South African National Treasury seminar series. We are also grateful for insightful discussions and advice from Marek Hanusch, Nic Spaull, and Servaas van der Berg.

Contents

I. INTRODUCTION

South Africa suffers from weak educational quality, despite relatively high levels of public spending on education. The country spends on average the equivalent to over 6 percent of its GDP on education, on par with many OECD countries. However, a significant number of sub-Saharan Africa (SSA) countries that spend far less per learner[2] than South Africa have far better educational outcomes. South African ninth-grade learners were second-to-last in a ranking of 39 countries by the International Association for Evaluation of Educational Achievement for eighth-grade learner mathematics performance and last in science performance in 2015. About half of South Africa's students drop out of school before completing secondary education. Among the learners who write the end of high school examinations, about a quarter fail. Moreover, less than 5 percent of students who start primary school end up with a university qualification.

The microeconomic returns of education are well established in literature. Firstly, education is one of the determinants of the productivity of the labor force, and thus affects the economic growth through the human capital factor of production (Hanushek and Wößmann, 2007). Secondly, education reduces the duration and incidence of unemployment (Mincer, 1991). And finally, education improves the welfare of citizens by reducing poverty incidence and income inequality. Coady and Dizioli (2017) find evidence that increasing average years of school reduces income inequality, particularly for developing countries and emerging economies, while Awan *et al.* (2011) find evidence that educational enrollment is negatively related to poverty incidence.

At the macroeconomic level, the *quality* of education affects long-run growth. Hanushek and Wößmann (2012) argue compellingly that looking at only years of schooling—as is frequently the case of authors who use Barro-Lee datasets—is insufficient and noisy. What matters more are the levels and changes in educational achievement, i.e., qualitative aspects. Thus, our paper devotes a lot of space to the issue of the quality of education.

Indeed, educational enrollment has not always led to expected socio-economic returns (Hanushek and Wößmann, 2007). They argue that what matters over and above enrollment in education is the quality of education. The authors argue that it is the extent to which education enhances the cognitive skills of learners that leads to improvements in employment, individual earnings, distribution of income and economic growth. South Africa is a classic example. Over the past decades, the South African government has made significant strides in expanding access to primary and secondary education with relatively limited socio-economic returns.

The main objective of this paper is to provide a structured overview of the dynamics of South Africa's educational quality through a selective narrative literature review. First, this paper brings out the key stylized facts about South Africa's education system, focusing on inputs and outcomes. Second, the paper highlights the key causes of South Africa's significant

[2] In South African usage, "learner" refers to children enrolled in primary and secondary education. "Student" refers to those enrolled in tertiary education.

challenges in the quality of education outcomes. Third, it outlines the primary socio-economic implications, and then finally this paper highlights possible policy interventions.

The main findings of the paper are the following:

- South Africa has achieved significant improvements in access to education, but the quality of education is significantly lagging, and secondary education completion rates are comparatively low. Due to conscious government efforts since the fall of apartheid, access to education at a primary level is almost universal. Enrollment at the secondary level has also been expanding. However, completion rates at this level are low. In 2015, almost half of South Africans aged between 25 and 34 had not completed upper secondary education.

- The battle is usually won or lost at primary school. A substantial part of the low rates of retention is caused by learning deficits acquired at the primary level due to the low quality of education. In a group of fourth-grade learners from 49 countries, South African fifth-grade learners ranked bottom last in Trends in International Mathematics and Science Study (TIMSS) test scores. Moreover, secondary education is failing to address these gaps. In a group of 39 mathematics and science eighth-grade learners, South Africa's ninth-grade learners rank bottom and second last, respectively, in TIMSS test scores. Peer countries such as Kenya, Swaziland, and Botswana out-rank South African learners in reading and mathematics scores.

- The learning deficits in South Africa's secondary education, in turn, make the transition from secondary education to tertiary education difficult. In 2015, only 14 percent of the cohort of learners who started primary education enrolled for tertiary education after 12 years. Moreover, more than a quarter of students enrolled for tertiary education dropped out in their first year of study.

- The causes of South Africa's low quality of education are complex and multifaceted. The consensus in the literature is that inadequate funding is not the primary cause of lagging performance, although the distribution of resources may be problematic. Indeed, the country spends 20 percent of the budget on education. What is clear, however, is that historical factors explain a significant part of the current status quo. This is evident in that the population groups that the apartheid government denied quality education are the population groups that have the poorest educational outcomes today. At a primary and secondary level, South Africa's education system is bimodal. The poorest 75–80 percent of learners depend on dysfunctional public schooling and achieve poor outcomes while wealthiest 20–25 percent of learners enroll in private schools and functional public schools, and achieve better academic outcomes.

- The bimodality of South Africa's education system is perpetuating economic inequality through employment and earnings channels. Poverty incidence rates and unemployment rates are distributed according to levels of education and race. The highly-educated were the primary beneficiaries of the skill-intensive economic growth in the early 2000s. During this period, the share of employment in the tertiary sector expanded at the expense of the share of the primary sector while primary completion expanded, and tertiary education remain stagnant. At a macro level, given the international evidence, it seems likely that the general low quality of South Africa's education has partly contributed to the sluggish long-run economic growth.

- Government interventions have had relatively limited success in redressing the situation. Eighty percent of South Africa's dysfunctional schools are in townships and rural communities. While management in these schools tends to have limited capacity, according to the literature, what is most worrying is the fact that teachers from these schools tend to have lower subject content knowledge and few systems to hold them accountable. This challenge is exacerbated by the political influence that teacher unions have in the education system.

The policy considerations in this paper draw on both the international and domestic literature on what seems to work and what does not. We draw heavily on the work of van der Berg *et al.* (2011), Mbiti (2017), Spaull (2011; 2013), and Evans and Popova (2016). The consensus seems to be that, in line with international trends, most of the increase in educational spending in South Africa has been aimed at increasing access and inputs, but quality has significantly lagged. Put differently, more resources do not unconditionally improve student outcomes. For instance, while South African teachers are well compensated by international standards, the structure of the pay system is inflexible and inefficient.

Fundamentally, in the context of South Africa, improved teacher training to close gaps in knowledge, improved school management, and greater teacher accountability are some of the possible measures that have the greatest potential to improve educational performance in the long term. In the short run, significantly improving the availability of textbooks and related learning materials is likely to positively impact learner performance.

Mbiti (2016) best sums the bottom line in terms of policy recommendations. A large variety of input-based policies on their own are largely ineffective in increasing learning outcomes in the absence of complementary initiatives to improve accountability and pedagogy. Unfortunately, the political economy seems to favor input-based policy measures mainly because they are visible—politicians love ribbon-cutting after all—and also, they provide resources that can be captured, a highly relevant issue in South Africa.

While a systematic literature review in the form of a meta-regression would enable us to establish an unbiased quantitative view of literature findings, we have chosen to summarize key findings through a narrative review instead of a meta-regression for three reasons. First, the empirical literature on South Africa's education system is too thin to derive an adequate sample for a meta-regression for the type of overarching review that we intend to undertake,

with particular emphasis on internationally comparable quality metrics. Second, a narrative review, by definition, allows us to undertake a much broader and more nuanced view, whereas with a meta-regression we would be compelled to narrow the scope of our study in function of the availability of quantified studies. Finally, our aim is to highlight the mechanisms through which the causes and consequences of South Africa's lagging educational quality manifest themselves in the economy. A narrative review allows us to perform a stock-taking of literature findings around these dynamics and, through theory and intuition, explore the channels in greater depth.[3]

II. METHODOLOGICAL CONSIDERATIONS

There exists no generally accepted systematic methodology for performing a selective narrative review. In an attempt to be as comprehensive and up to date as possible, our paper draws inspiration from Evans and Popova (2016), who perform a review of reviews of the policy interventions that improve learning outcomes in developing countries. In line with Evans and Popova (2016), our methodology for reviewing papers is made up of a search strategy and inclusion criteria, and an approach to analysing papers. We also discuss our methods for finding comparator data for our benchmarking analysis below.

A. Search and Inclusion of Papers

We conducted a search for articles on Google Scholar and the IMF digital library using the phrases; "education in South Africa" and "education in developing countries". A paper was shortlisted for possible selection if it covered one of the areas of focus in our study, namely, trends in educational enrollment, quality of education, explanatory factors for poor learning, the socio-economic impact of education, and policy interventions. We also identified the experts on the subject of the economics of education in South Africa, searched and shortlisted their papers. To ensure that our study was up to date, we generally limited the focus to papers that had been published in the year 2010 or after. In some instances, we did include older seminal papers that are often cited in literature. An unpublished paper was only included in our study if it was the work of an expert in the field or a submission to policymakers.

B. Analysis of Papers

Our paper is a narrative review and thus focuses on understanding channels rather than quantifying them *per se*. So, for instance, when highlighting the causes of lagging educational quality, we list and discuss the explanatory variables that studies have identified, with less emphasis on the magnitude of the explanatory variables. We do, however, conclude by discussing what we consider to be the main causes of challenges in educational outcomes given the literature review. This is performed by drawing on what experts in the field have found, and analysing channels in the context of the consensus in international literature. The discussion in our policy considerations section is informed by the conclusions derived in our explanatory factors section. In other words, we discuss policy interventions that we believe are most likely to directly address the main causes of lagging outcomes.

[3] Besharati and Tsotsotso (2015) do conduct a meta-analysis, but it is based on rather narrowly focused studies.

C. Data and Benchmarking

In order to establish stylized facts about South Africa's education system and conduct a benchmarking analysis, we rely on the available data from several different sources to establish trends and benchmark South Africa. We searched the databases of the World Bank Indicators, the OECD, Barro-Lee, Department of Higher Education and Training and Statistics South Africa for various outcomes of our study. A dataset was only included if it had been updated for at least the year 2015. The United Nations Educational, Scientific and Cultural Organization Institute for Statistics has a comprehensive dataset on various educational variables. However, we could not use the dataset as it only captures data for a handful of African countries. Moreover, South Africa is missing from the dataset for many of the educational variables that we are interested in.

Our aim was to consistently benchmark South Africa against peer SSA countries, low-to-middle income countries, and emerging markets, but sometimes we were limited by the availability of data. Thus, our group of comparator countries varies across the paper as comparator countries were mainly based on the availability of data. We do, however, highlight the important caveats around selected comparator countries throughout the paper. Our study also provides a comprehensive set of the latest results in comparative international testing metric in which South Africa takes part. We have identified these to be Progress in International Literacy Study (PIRLS), TIMSS, and Program for International Student Assessment (PISA), and use their latest results. Details on the methodologies used in the various tests are given in Appendix II.

Since the IMF does not produce education statistics, the use of third-party indicators is inevitable. Unlike some third-party indicators that are based on perceptions, we base our results on the above international tests. That said, relative positions are conditioned by the number of countries participating in the tests. Nonetheless, the absolute levels do provide a very good measure of the quality of education. Unfortunately, most low-income countries do not participate in the tests. We, therefore, complement the international tests with the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEQ).

III. Stylized Facts about South Africa's Educational Outcomes

This section presents an overview of the key stylized facts in South Africa's education system at a primary, secondary, and tertiary levels. In each sub-section, we benchmark South Africa against peer countries and global standards. We begin by focusing on input indicators such as government spending and then move on to completion, quality, and related metrics. In the primary and secondary levels of education, we end by highlighting measures of quality based on PISA test scores.[4]

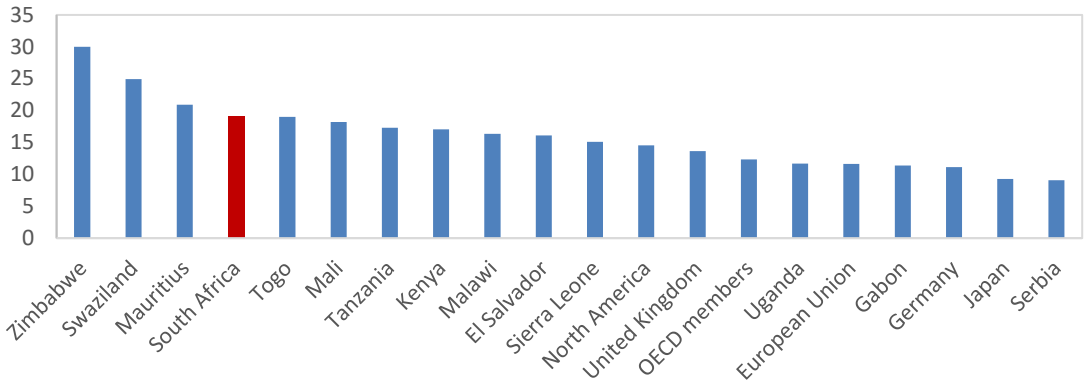
[4] See Appendix I for a comprehensive list of data sources used in this paper.

A. Primary School Level

Input indicators

South Africa's expenditure on education has been increasing in recent decades and the level of expenditure is now comparable with affluent countries and well above peer SSA countries. Historically, the apartheid government deliberately under-resourced black schools in order to limit the educational achievements of black learners. Indeed, in 1994 spending on white learners (former "Model C" schools) was 1½ times higher than that of black learners in urban areas and five times higher than in rural areas (Branson *et al.* 2013).[5] The increase in government spending on education over the past two decades was an attempt to redress this trend and was accompanied by numerous reforms, including the revamping of the school curriculum. In 2015, the South African government spent about 20 percent of the budget and 6 percent of the nation's GDP on education, exceeding many SSA countries and the OECD average of 5.2 percent (Figures 1 (a) and 1 (b)).

Figure 1 (a): Expenditure on Education as a Proportion of Total Government Expenditure in 2015



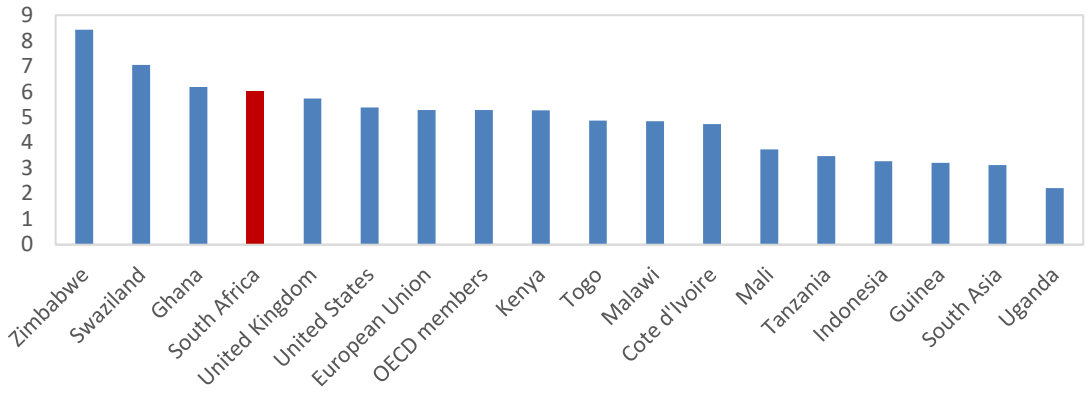
Source: World Bank (2017).

Per capita expenditure on primary education substantially exceeds that of peer sub-Saharan countries and rose during the period 1999–2015. As illustrated in Figure 2 below, South Africa's spending on primary education as a percentage of GDP per capita increased from 13 percent to 18 percent between 1999 and 2015.[6]

[5] Model C schools refer to public-private schools located in urban areas and exclusively reserved for white learners during apartheid.

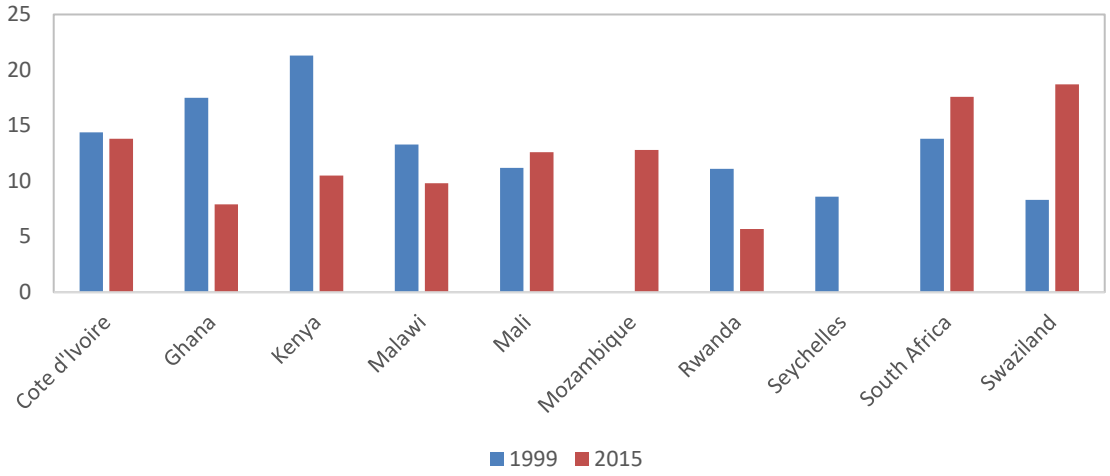
[6] Data for Mozambique in 1999 and Seychelles in 2015 was not available. More recent data (e.g., from Spaull (2018)) shows that there has been some decline in per capita spending on primary school learners mostly due to a sharp increase in birth rates following the introduction of free ARVs in the mid-2000s.

Figure 1 (b): Government Expenditure on Education as a Proportion of GDP in 2015



Source: World Bank (2017).

Figure 2: Government Spending on Primary Education per Student as a Percentage of GDP per Capita



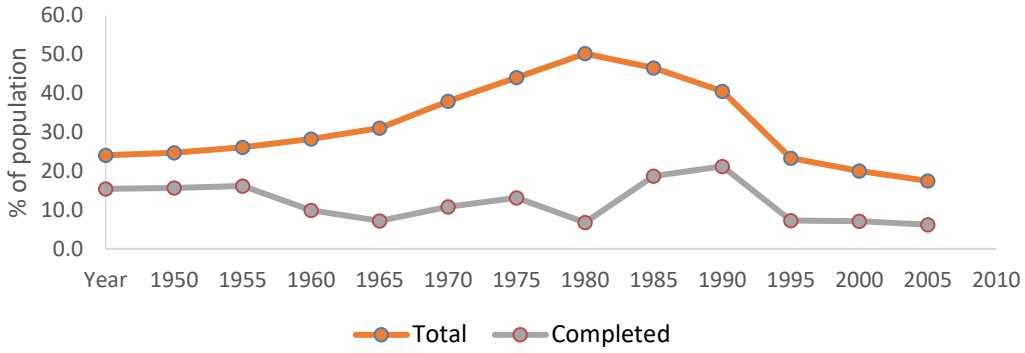
Source: World Bank (2017).

Enrollment indicators

South African learners have been enrolling for primary education in increasing numbers and enrollment in primary grades is now almost universal. In South Africa, educational enrollment is compulsory from Grade 1 to Grade 9. The proportion of young South Africans aged below 15 years who only had primary school as the highest level of education obtained fell from 15 percent to 6 percent between 1950 and 2005 (Figure 3). Van der Berg *et al.* (2011) observe that South Africa's attainment rates of levels of education up until 11 years of age are higher than most middle-income countries. Figure 3 below shows that only around 5 percent of South African adults had primary education as the highest level of education in 2015. The proportion of South African learners who proceed with their education beyond primary education is

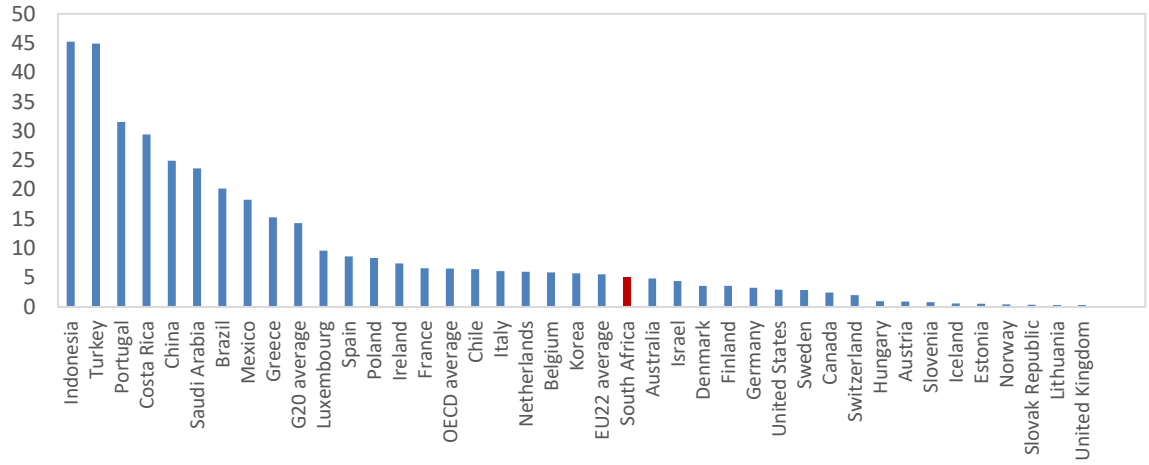
comparable with many OECD countries and is actually better than that in most other emerging markets.

Figure 3: Proportion of Population over 15 Years Who Had Primary Education as their Highest Level of Education



Source: Barro-Lee (2015) Dataset.

Figure 4: Proportion of Population Aged between 25 and 64 Whose Highest Level of Education Was at a Primary Level in 2015



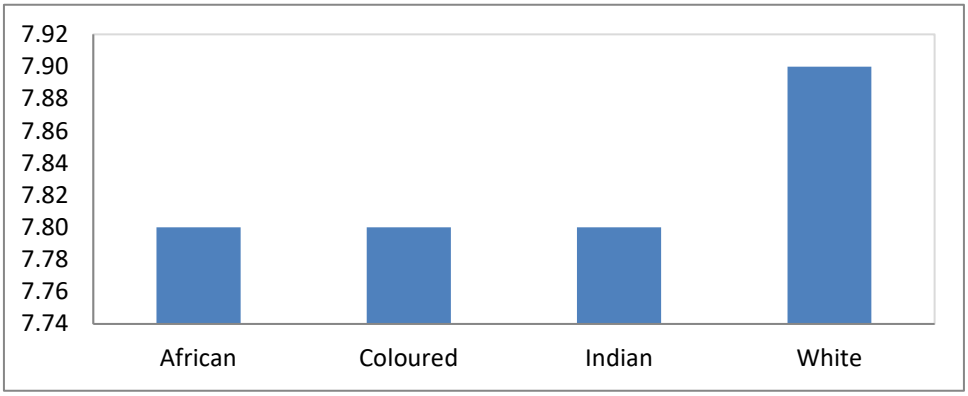
Source: OECD (2016).

The trends in South Africa's basic education enrollment are similar across population groups. Figure 5(a) below depicts the expected years of schooling according to racial groups and does not show statistically significant differences.[7] Indeed, South Africa has made significant strides in addressing the disparities in primary education enrollment among different races. As illustrated in Figure 5(b), the share of white South Africans who had primary education as their highest level of education attained (1 percent) is much lower than the share of white South Africans in the total population (9 percent). Nevertheless, for most racial groups, the

[7] Statistics South Africa (2016) defines the average years of schooling as the number of years during which a child entering school can expect to spend in full-time and part-time schooling during their life cycle, based on the school enrollment rates of the time.

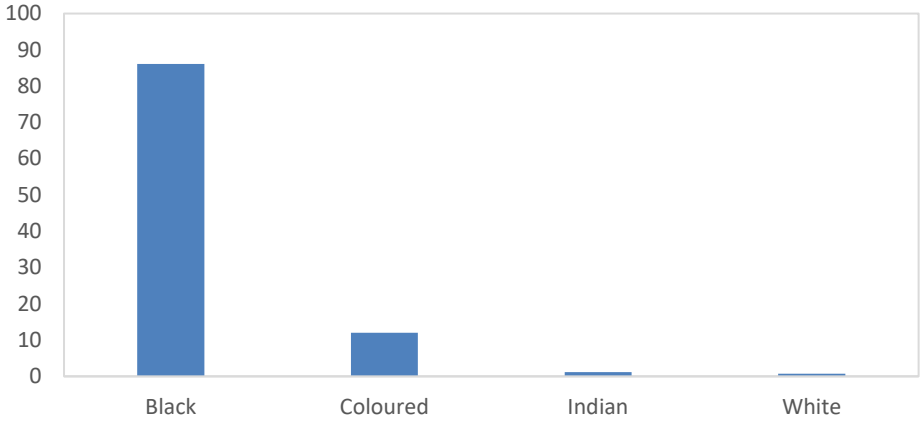
share of primary education attainment for most racial group as the highest level does not deviate from the share of total population.

Figure 5 (a): South Africa's Average Years of Primary Schooling by Population Group in 2016



Source: StatsSA (2016).

Figure 5 (b): South Africa's Proportion of Individuals Aged 25–64 Whose Highest Level of Education was Primary Education in 2016



Source: StatsSA (2016).

Quality indicators

While government spending and access to primary education has been expanding, the quality of South Africa's education substantially lags international standards.[8] Since 1995, the TIMSS has tested science and mathematics in the fourth and eighth grade every four years with

[8] The term "quality" of education has various definitions in the literature on education. In this paper, it refers to cognitive skills that learners develop through school with desired outcomes that can be assessed. However, as per Heyneveld and Craig (1996), quality may also refer to both the inputs and outputs of education. It can refer to how the how environment in which learning taking places changes and the quantifiable gains in the skills, knowledge and values of learners. Our analysis on quality focuses on the cognitive skills that learners develop in literacy, science, and mathematics.

between 38 and 52 countries participating in the study. Additionally, the PIRLS has tested fourth-grade reading achievement every five years since 2001, with participation from around 48 countries.

Since its initial participation in TIMSS and PIRLS in 1995 and 2006 respectively, South Africa has consistently ranked in the bottom positions. Figure 6 below shows that South Africa's fifth-grade learners ranked bottom last in mathematics achievement when benchmarked against fourth-grade learners from 39 countries.[9] East Asian learners lead achievements in mathematics at a fourth-grade level. South African learners fall behind with a substantial gap. Singaporean learners top the list, achieving an average score of 681 points while South African learners only managed 376 points.

South Africa's primary learners have consistently achieved the lowest scores in international reading tests. According to PIRLS (2017), South Africa's average reading score for Grade 5 barely changed between 2011 and 2016. In 2016, South African learners ranked last in reading scores in a sample of fourth-grade learners from countries participating in PIRLS (Figure 7). South African learners, therefore, exhibit substantial deficits in critical learning skills at early levels of education. These deficits in critical literacy skills not only persist throughout higher levels of education, but ultimately spillover to all other subjects. It is encouraging, however, that there have been signs of improvements over the past ten years.[10]

The quality of South Africa's education at the primary and secondary levels also lags against peer SSA countries with much lower budgets on education. The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) is a consortium of education policy-makers and researchers who work with the International Institute for Educational Planning (IIEP) to improve the research capacity and technical skills of educational planners. The SACMEQ performs surveys in member countries to provide an analysis of the conditions of schooling and the quality of basic education.

Table 1 below shows that when compared to learners in SACMEQ countries, South African learners rank mid-table in reading and mathematics scores. While the sample excludes several other SSA countries which South Africa might be outperforming, it is concerning that South Africa is outperformed by countries with a lower allocation of government spending to education as a proportion of GDP and in per-student terms. Moreover, according to Spaull (2011), South Africa's quality of education lags so much that an analysis of SACMEQ III tests results finds that learners who repeat grades still achieve poorer outcomes than learners enrolled in that grade for the first time. Notwithstanding the fact that South Africa is still

[9] It is important to note that the TIMSS and PIRLS sample is made up of mostly advanced economies. There many developing countries that have not been included in the sample which may be performing worse than South Africa. Moreover, while South Africa is still underperforming, TIMSS test scores have been improved from 2003.

[10] According to the Department of Basic Education (DoBE, 2019), South Africa's PIRLS results improved by standard deviation of 0.06 every year.

lagging, it is encouraging that the country made significant improvements in tests scores between 2007 and 2013.[11]

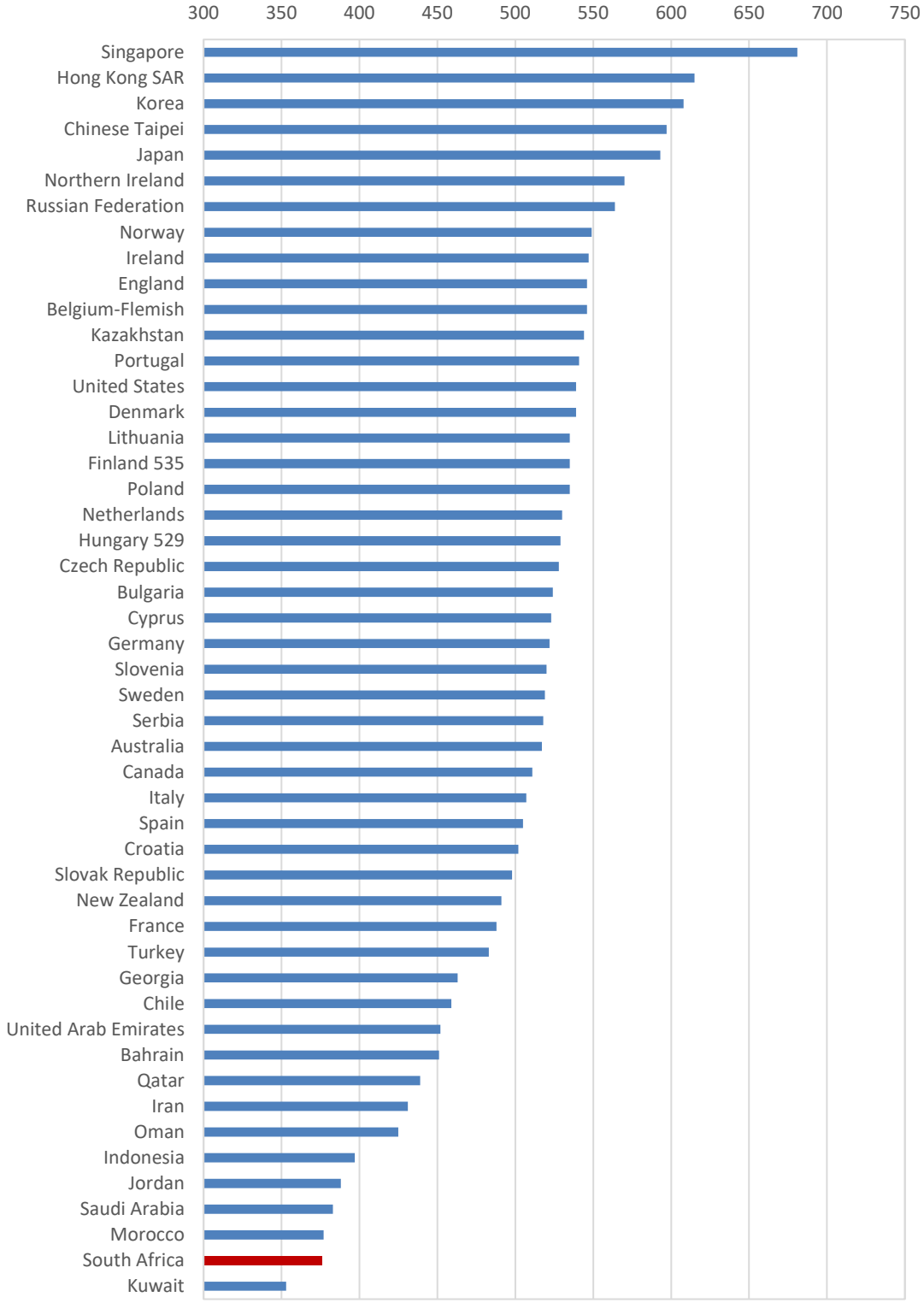
Table 1: SACMEQ 2007 and 2013 Test Results

Country	Learner reading score			Learner mathematics score		
	2007	**2013**	**Diff**	**2007**	**2013**	**Diff**
Mauritius	574	597	23	623	694	71
Kenya	543	601	58	557	651	94
Seychelles	575	602	27	551	630	79
Swaziland	549	590	41	541	601	60
Botswana	535	582	47	521	598	77
South Africa	**495**	**558**	**63**	**495**	**587**	**92**
Uganda	479	554	75	482	580	98
Zimbabwe	508	528	20	520	566	46
Lesotho	468	531	63	477	559	82
Namibia	497	599	102	471	558	87
Mozambique	476	519	43	484	558	74
Zambia	434	494	60	435	522	87
Malawi	434	434	0	447	522	75
SACMEQ (Average)	***500***	***507***	***7***	***507***	***584***	***77***

Source: SACMEQ (2017).

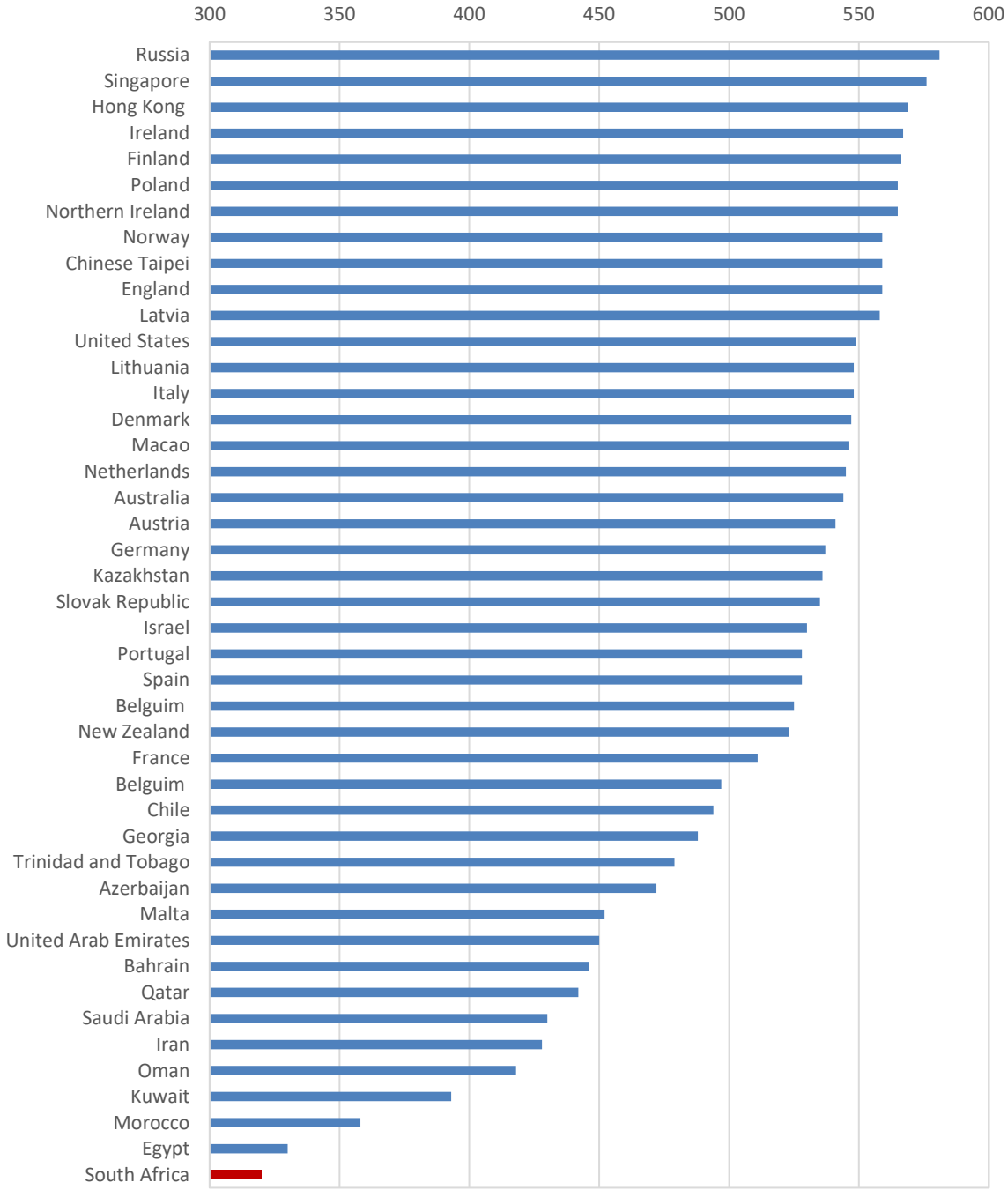
[11] For instance, similar to PIRLS results, SACMEQ Grade 6 mathematics improved by 0.06 standard deviations a year.

Figure 6: 4th Grade International Achievements versus 5th Grade South African Achievements in Mathematics in 2015



Source: TIMSS (2015).

Figure 7: 4th Grade International Achievements versus 5th Grade South African Achievements in Reading in 2016



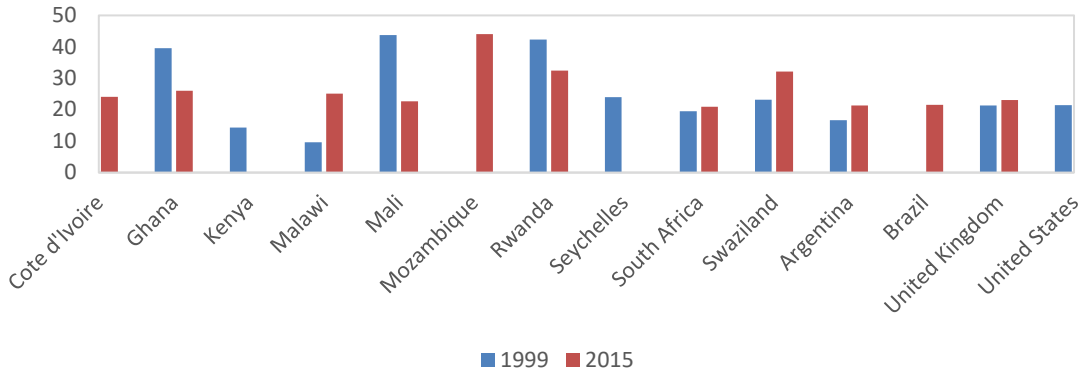
Source: PIRLS (2017).

B. Secondary School Level

Input indicators

The proportion of spending on secondary education is lower in South Africa than many SSA countries, although it is similar to that of many emerging markets and advanced economies. Nonetheless, South Africa and Malawi are the only SSA countries in our sample to have increased relative spending on secondary education during the period 1999–2015. However, since South Africa had a relatively low allocation of spending on secondary education due to historical reasons, the marginal increase of 1 percentage point was not enough to reverse this trend. The fact that South Africa's secondary education expenditure is comparatively low may be an issue since secondary education requires more resources than primary education, particularly for science subjects.

Figure 8: Government Spending on Secondary Education per Student as a Percentage of GDP per Capita



Source: World Bank (2016).

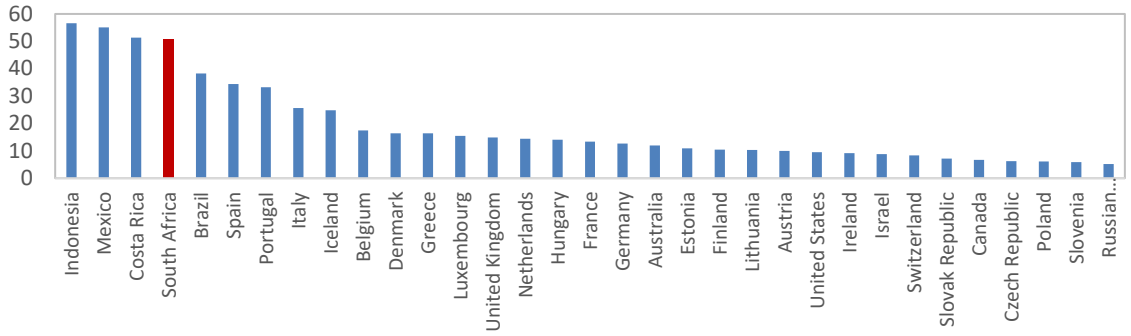
Enrollment indicators

Low retention rates in South Africa's education system start in lower secondary school grades. Van der Berg *et al*. (2011) observe that while enrollment at the primary school level is almost universal, beyond the ages of 12 years, South Africa's attainment rate ranks in the bottom among middle-income countries. Branson and Leibbrandt (2013b) also report increases in educational attainment in South Africa have been at an incomplete secondary level. In 2015, half of South Africans aged between 25 and 34 had their highest educational qualification below upper secondary (Figure 9). According to Spaull (2011), only half of South African learners who enrolled in primary school complete matric after 12 years.[12] Furthermore, as illustrated in Figure 10, only a third of South African learners enrolled for secondary education complete secondary education in the minimum number of years. That said, there is some improvement in secondary completion. According to the DoBE (2019),

[12] Matric (short for matriculation) is the certificate that sanctions the end of secondary school.

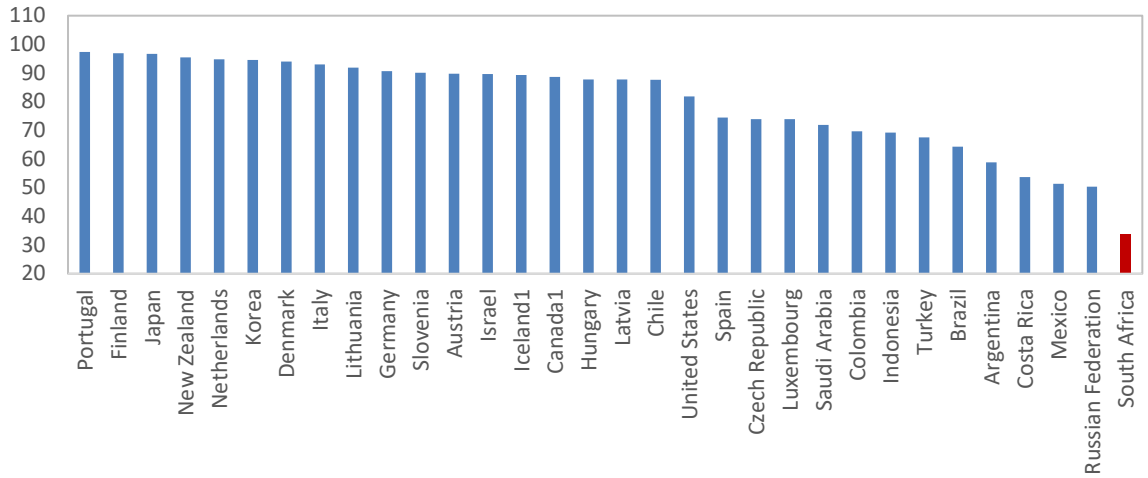
between 2005 and 2017, the percentage of youth successfully completing Grade 12 increased from 45 percent to 55 percent.

Figure 9: Proportion of Population aged Between 25 and 34 Years Whose Highest Level of Education was Below Upper Secondary in 2015



Source: OECD (2016).

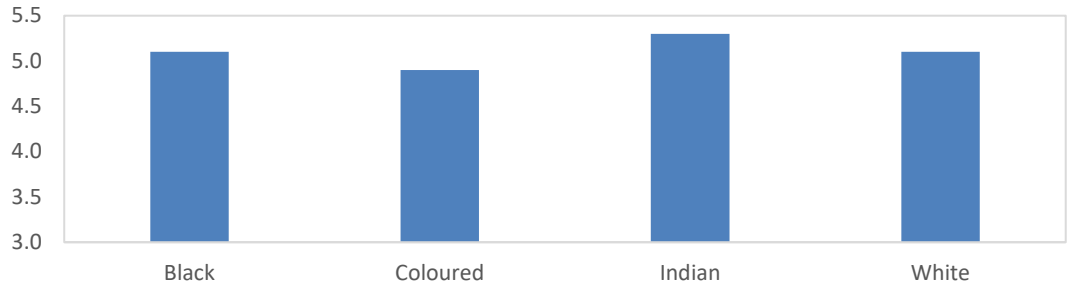
Figure 10: First-Time Upper Secondary Graduation Rates in 2014



Source: OECD (2016).

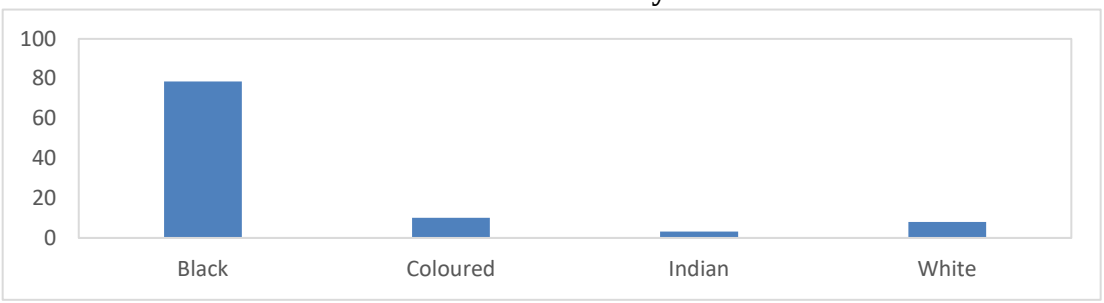
Similar to primary education, there are no significant disparities of educational attainment among population groups. Figure 11 (a) below shows that on average South African learners spend similar length of time in secondary education. Indeed, as illustrated in Figure (11b), the racial shares of South Africans whose highest level of education was secondary is similar to the total racial shares in the population.

Figure 11 (a): South Africa's Average Years of Secondary Schooling by Population Group in 2016



Source: Stats SA (2016).

Figure 11 (b): South Africa's Proportion of Individuals Aged 25–64 Whose Highest Level of Education was Secondary Education in 201



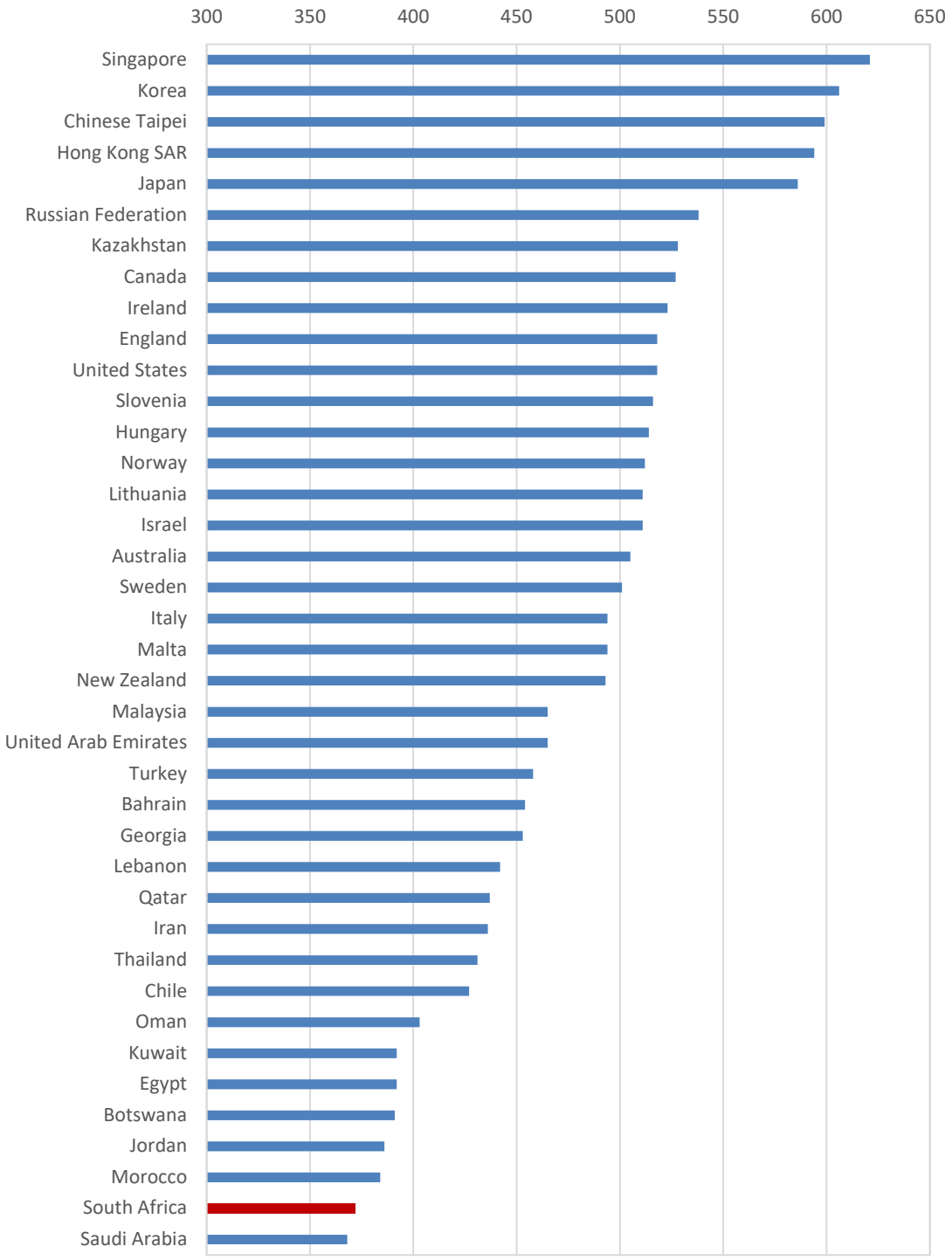
Source: Stats SA (2016).

Quality indicators

The lagging outcomes in the quality of primary education persist at a secondary level. Figures 12 (a) and 12 (b) below show that South African eight-grade learners' performance in mathematics and science ranked bottom among other countries in 2015. Moreover, the gap between South Africa and the best performing countries is substantial. Singaporean learners topped the list for eight-grade mathematics with a score of 621 points while South African learners achieved 371 points in the second bottom position. The fact that nations with the best outcomes in fourth-grade TIMSS test scores also top eight-grade scores highlights the importance of primary education in preparing learners for their school careers. It is, however, important to note that similar to SACMEQ and PIRLS, South Africa's TIMSS results have steadily been improving, albeit from a low starting point, between 2002 and 2015 (DoBE, 2019).

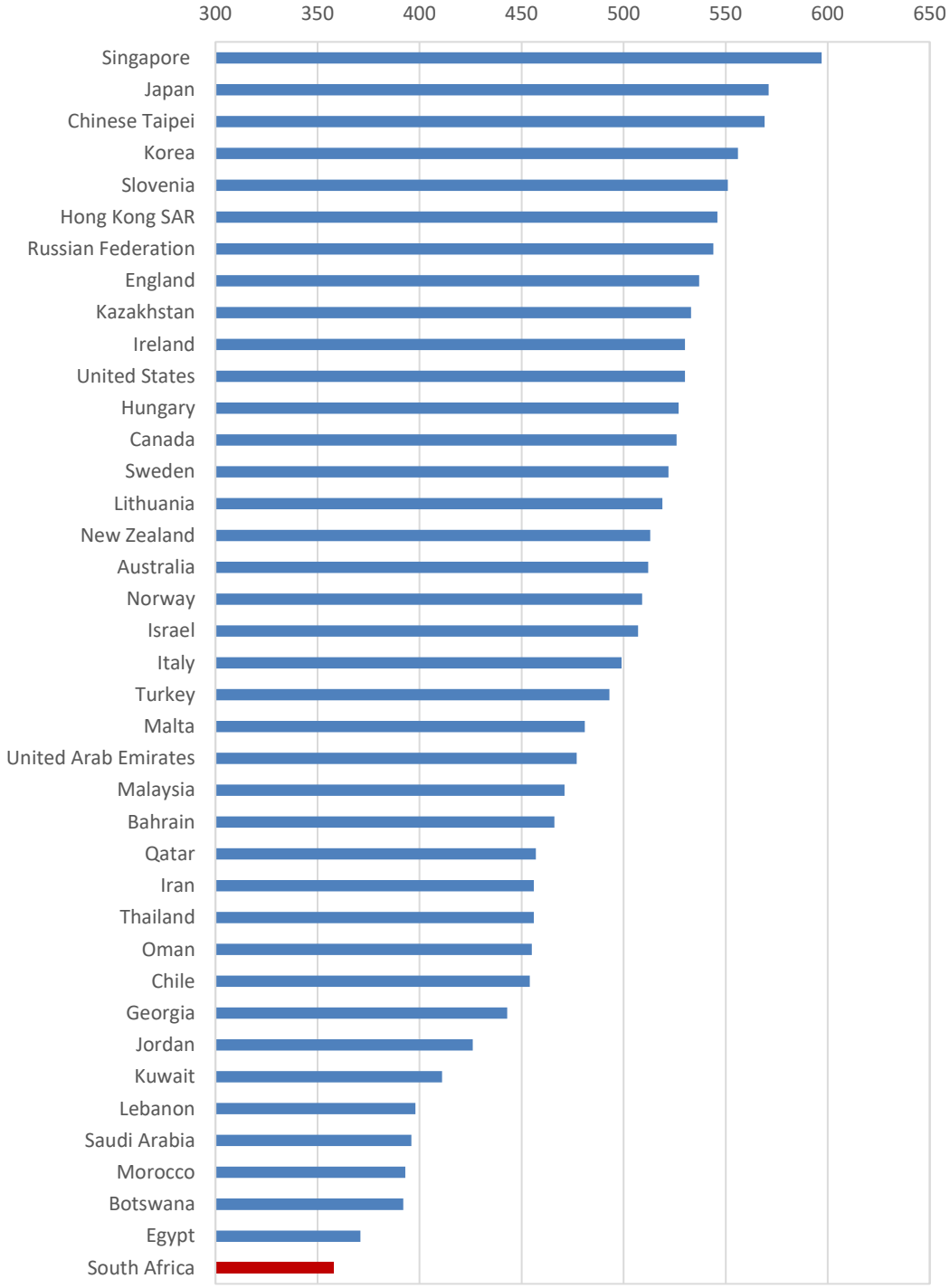
DoBE (2019) argues that while it is impossible to attribute the improvement scientifically to specific drivers, there are some probable explanatory factors. These include: (i) much improved teaching guides—which have been more rigorously enforced—under the Curriculum and Assessment Policy Assessment (CAPS) initiative; (ii) improved subject knowledge by newly graduated teachers; (iii); provision of higher quality textbooks to learners; and (iv) stronger foundations for reading at pre-primary (kindergarten) levels (grade R).

Figure 12 (a): South Africa's 9th Grade Mathematics versus 8th Grade International Achievements in 2015



Source: TIMSS (2015).

Figure 12 (b): South Africa's 9th Grade Science versus 8th Grade International Achievements in 2015



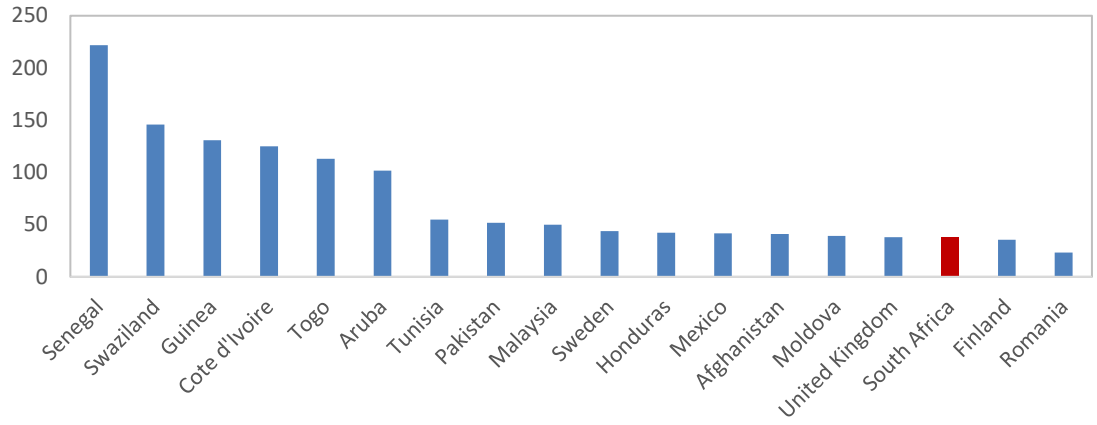
Source: TIMSS (2015).

C. Tertiary Education Level

Input indicators

In contrast to government expenditure patterns in the lower levels of education, South Africa's tertiary education has been relatively underfunded. As illustrated in Figure 13, government expenditure per tertiary student as a proportion of per capita GPD was 38 percent for South Africa substantially lagging behind peer countries such as Senegal, Guinea, and Swaziland. In 2018, a policy reform was introduced to address inadequate government expenditure on tertiary education in the form of fee-free tertiary education for students coming from families with household income up to R350 000 per annum. However, given the very high-income threshold, the scheme is likely to be costly and may crowd out other spending at the primary and secondary levels.[13]

Figure 13: Government Expenditure per Tertiary Student as a Percentage of GDP per Capita in 2014



Source: World Bank (2018).

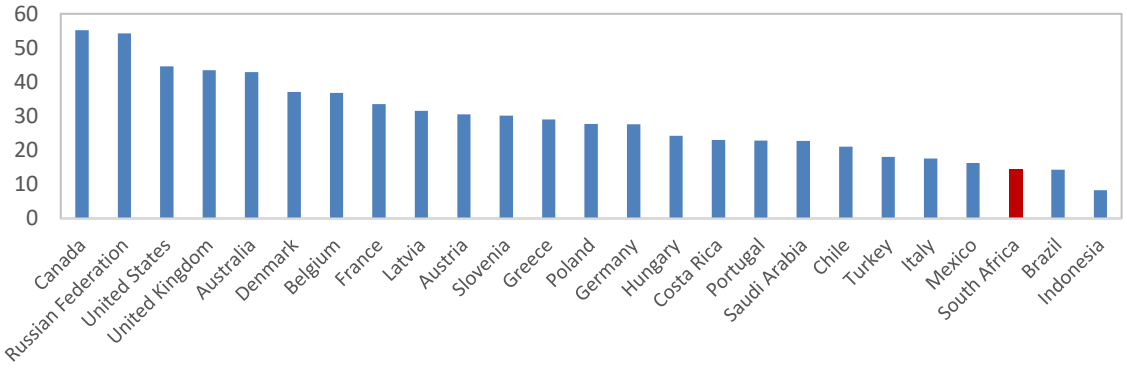
Enrollment indicators

The relatively low levels of government spending in tertiary education and relatively low quality of education at lower levels in part explain the low levels of tertiary enrollment rates**.** According to the DHET (2016), just over one million South Africans enrolled in tertiary education in 2010, representing around 2 percent of the population. Moreover, Van der Berg *et al.* (2011) observe that expanded access and high rates of grade progression at primary and secondary levels amidst lagging quality of education lead to massive drop-outs before matriculation. For those few learners who do reach matric, academic performance is usually well below minimum university entrance requirements. Additionally, Moses, Van der Berg and Rich (2017) observe that financial constraints are limiting university access for many of South Africa's learners.

[13] See Spaull (2018b).

In addition to low levels of enrollment, the level of retention and the average time taken to complete a first degree in South Africa's tertiary education are worrisome. According to Murray (2016), as many as 25 percent of students enrolled in tertiary education in South Africa drop out in their first year. These challenges remain despite the fact that South African universities have been implementing extended degree programs to help students manage the jump to tertiary education. The high dropout rate, low completion rate and extended years in tertiary education all undermine the efficiency of expenditure in South Africa's tertiary education. Figure 14 below shows that South Africa now finds itself lagging behind developed countries in terms of the proportion of the population which completed tertiary education. As illustrated in Table 2 below, the completion rates in South Africa's tertiary education are well below the targets in the National Development Plan (NDP) of at least 75 percent of a cohort of tertiary students completing their education. In 2015, only 25 percent a cohort of undergraduate students completed their degrees.

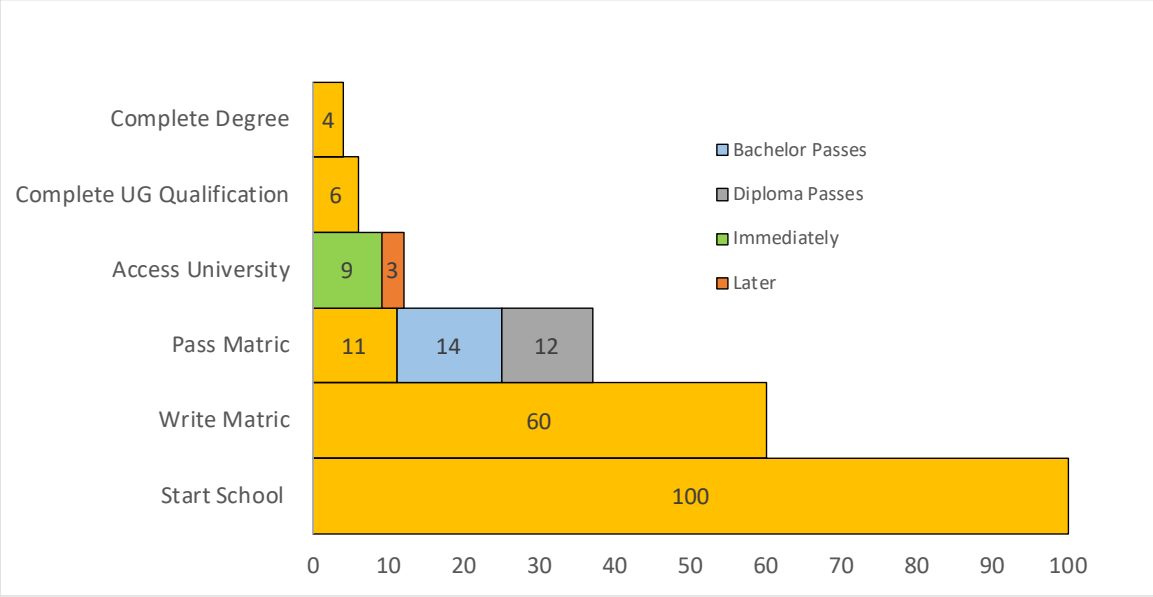
Figure 14: Proportion of Population Aged between 25 and 64 Years with Tertiary Education in 2015



Source: OECD (2016).

In a pathbreaking study, van Broekhuizen *et al.* (2016) use a unique dataset to investigate university access, throughput, and dropout rates for the 2008 matric cohort. First, they show that about one-third of those who have adequate matric results do not actually attend university. This is a significant loss for a skills-starved economy. In addition, those who do gain access take a long time to successfully complete their studies, thus clogging the system. Figure 15 vividly illustrates the qualifications pyramid. As can be seen from the chart, only 4 percent of the 2008 cohort ended up with a degree, six years after they matriculated.

Figure 15: Qualification Pyramid—From Primary School to University



Source: van Broekhuizen *et al.* (2016).
Notes: Bachelor passes are eligible for university entrance. UG: undergraduate.

Table 2: South Africa's Summaries of Graduation Rates in Public Higher Education Institutions in 2015 (in percent)

	Undergraduate	Doctoral
Contact programs	25	20
Distance programs	15	15

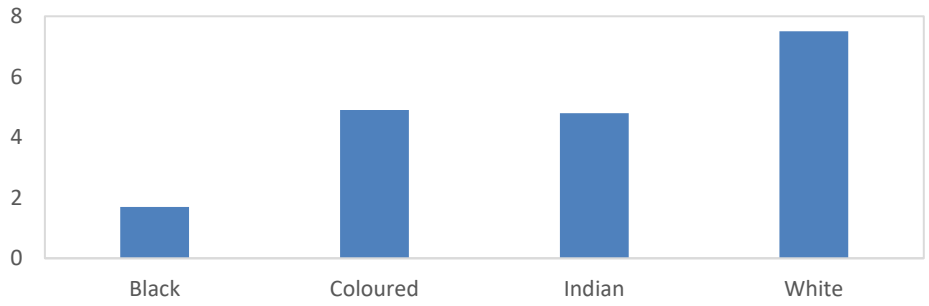
Source: Department of Higher Education and Training (2017).

There are substantial racial disparities in retention in South Africa's tertiary education. Figure 16 (a) below shows that on average black students spent less than 2 years in tertiary education while white students spent more than 7 years. Figure 16 (b) shows that while black South Africans account for around 80 percent of the total population, they only account for around 58 percent of South Africa's post-secondary education graduates. White South Africans on the other hand account for less than 10 percent of the population but 29 percent of the post-secondary graduates. This disparity is possibly due to a combination of three factors. First, black students, having received a poorer quality of education are most likely unprepared for tertiary education and hence drop out in the early years of tertiary education. According to the Department of Higher Education and Training (DHET, 2017), only 12 percent of black students enrolled for a three-year degree graduated within three years. Secondly, while white students are more likely to remain in tertiary education and pursue advanced degrees, black students often cannot afford to forgo the lost income that is associated with extending years of schooling. Hence, they typically move on to employment after the first university degree or diploma. Finally, many black students discontinue their studies even before graduating from their first degree due to financial constraints.

Quality Indicators

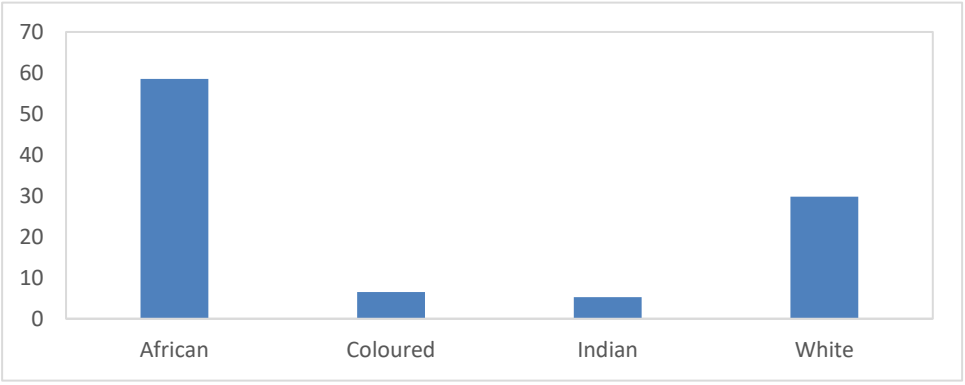
Contrary to the trends in primary and secondary levels, the intrinsic quality of education in South Africa's tertiary education far outperforms African peer countries and many other emerging countries.[14] According to the Times Higher Education (2017), eight of Africa's best universities are South African (Table 3). Furthermore, two South African universities also featured among the top ten universities in the BRICS and emerging economies. These findings are consistent with other rankings such as the Center for World University Rankings and the QS World University Rankings. The fact that South Africa has one of the poorest performing secondary education systems but among the best tertiary education systems in the developing world explains a great part of low enrollment and completion rates in South African universities. Learning deficits acquired at the lower levels of education make the jump to university too high for many of South Africa's students.

Figure 16 (a): South Africa's Average Years of Schooling Post-Secondary by Population Group in 2016



Source: StatsSA (2017).

Figure 16 (b): South Africa's Proportion of Individuals aged 25–64 Whose Highest Level of Education was Tertiary Education in 2016



Sources: StatsSA (2017).

[14] Times Higher Education ranks world universities across 6 scores, namely; teaching, research, citations, industry income and international outlook.

Table 3: Times Higher Education African Universities Rankings in 2018		
African Ranking	**University**	**Country**
1	University of Cape Town	South Africa
2	University of the Witwatersrand	South Africa
3	Stellenbosch University	South Africa
4	University of KwaZulu-Natal	South Africa
5	Makerere University	Uganda
6	American University in Cairo	Egypt
7	Beni Seuf University	Egypt
8	University of Johannesburg	South Africa
9	University of Pretoria	South Africa
10	University of the Western Cape	South Africa
Source: Times Higher Education (2017).		

Table 4: BRICS and Emerging Markets Universities Rankings 2018		
Ranking	**University**	**Country**
1	Peking University	China
2	Tsinghua University	China
3	Lomonosov Moscow State University	Russia
4	University of Cape Town	South Africa
5	University of Science and Technology China	China
6	Fudan University	China
7	Shanghai Jiao Tong University	China
8	University of the Witwatersrand	South Africa
9	Zhejiang University	Taiwan
10	National Taiwan University	China
Source: Times Higher Education (2017).		

While South Africa's tertiary education is also characterized by dualistic outcomes because of spatial planning under apartheid, the country's proportion of students who graduate from good tertiary education institutions has been improving. This is in part a result of expanding the access to formerly white universities to historically disadvantaged racial groups. In 1993, the gross university participation for blacks was only 9 percent these black students were usually concentrated in disadvantaged universities typically located away from main cities (Bunting, 2006). According to data from the DHET (2017), by 2015, black students represented 68 percent of university enrollment. Moreover, merging some formerly white universities with some formerly black universities enabled the latter to improve their educational outcomes.

However, this transformation strategy was not feasible for basic education for two key reasons. First, since the learner population is much larger than the tertiary student population, formerly white schools would not be able to accommodate historically disadvantaged learners. And second, spatial planning would still present transportation problems for poor learners to access good schools located in far urban areas.

IV. KEY EXPLANATORY FACTORS

Multiple and complex factors contribute to South Africa's underperformance in education. These factors are often related to the legacy of apartheid as reflected in differences in educational attainments among the various races. In this section, we highlight the key explanatory key factors identified in South Africa's literature on the economics of education.

A. Overview of Salient Factors

Funding

South Africa's expenditure on education is characterized by substantial disparities between inputs and outcomes. The weak correlation between spending and outcomes is also observed for many other developing countries by studies such as the World Bank (2018), but South Africa is clearly an outlier. The efficient frontier and the line-of-best-fit are two measures of the efficiency of inputs into education. The efficient frontier shows the optimal level of learner test scores given a level of education expenditure. Figure 17 (a) shows that in this PISA sample of countries, South Africa is the country furthest away from the efficient frontier curve, meaning that in terms of spending per student, South Africa is the most inefficient country in the PISA sample. The line-of-best-fit plots PISA scores against GDP per capita for a group of countries. This provides a visual display of the extent to which the quality of education is aligned or misaligned with the wealth of the nation.

As illustrated in Figure 17 (b), South Africa's quality of education was the worst in the sample, much worse than countries with similar levels of wealth. Moreover, South Africa is the country that is furthest away from the line-of-best fit. The countries that are closer to the line are closer to achieving.

As is the case in many developing countries, the key challenge is that South Africa's education system is not the allocation of funding but rather the efficiency with which resources are managed. As discussed in Section III above, government spending as a proportion of GDP at 6 percent is comparable with OECD countries. However, Murtin (2013) argues that when considering the proportion of South Africans who should be in school, South Africa's spending per pupil is low by international standards and should be increased by 30 percent at a primary level and 20 percent at the secondary level to match the level of resources allocated per pupil in OECD countries (Murtin 2013).

While he argues that the spending on education per capita GDP is not an accurate measure of whether allocations to education are adequate, the alternative that the author provides is not robust. In order to accurately compare the levels of spending on education, we would need to calculate the spending on education per enrolled pupil. While South Africa has a younger population than many OECD countries, many of South Africa's young people, particularly above the teenage years, are not in school.

Figure 17 (a): PISA Score and Education Spending in 2015

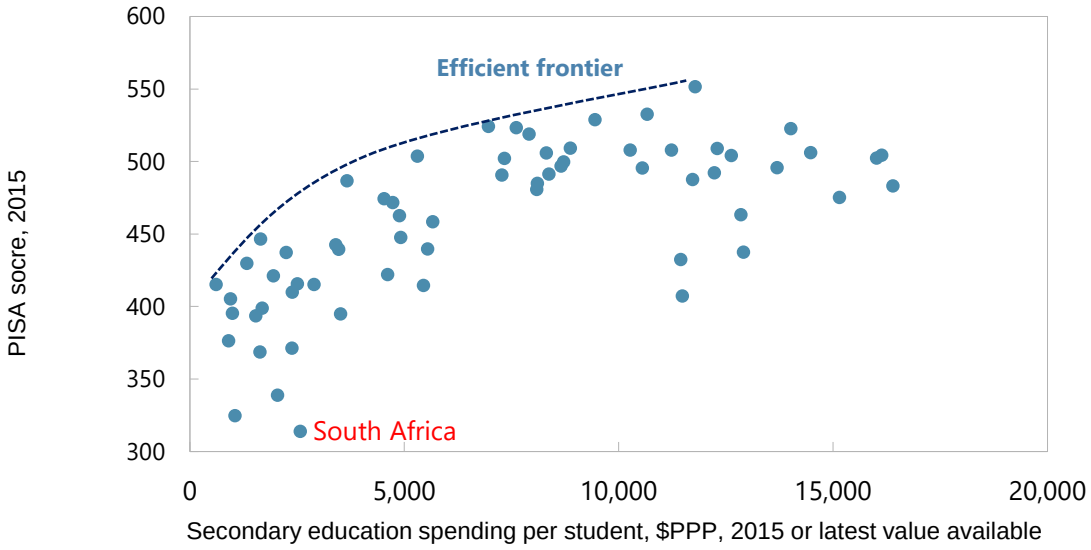
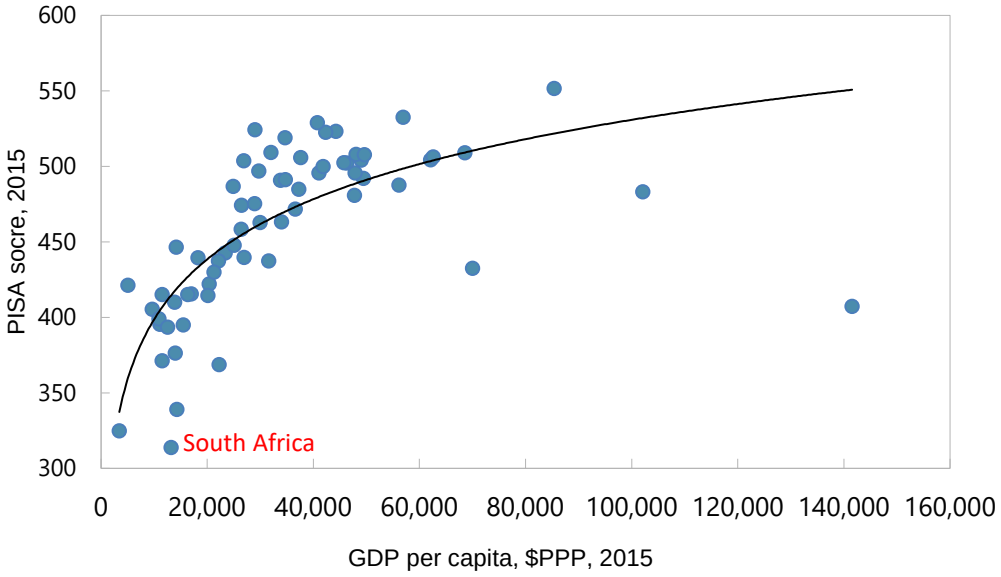


Figure 17 (b): PISA Score and GDP per capita $PPP in 2015



Sources: OECD; World Bank; and IMF staff estimates. Note: PISA scores assess the competencies of 15-year-olds in reading, mathematics, and science. Education spending is measured in dollars at purchasing-power parity (PPP). The estimated South Africa PISA score is a mapping from the TIMSS score using the methodology of OECD, 2015, *Universal Basic Skills.*

The availability of resources is an important determinant of outcomes, but beyond the subsistence level of resource allocation, returns are low. The importance of school resources in learner outcomes has been adequately demonstrated in studies such as Case and Deaton (1999). They use household data and controlling for age, socioeconomic status, and geographical location, they find that the pupil-teacher ratio affected the level of educational

attainment and enrollment. On the other hand, studies such as Wößmann (2016) find that resource allocation only accounted for a small aspect of cross-country variations in learner achievements. Moreover, Van der Berg (2008) shows that more resources do not unconditionally lead to better educational outcomes in South Africa.

This is not to undermine the role of government spending in educational outcomes. Jackson, Johnson, and Persico (2015) find evidence that school resources are associated with student outcomes using individual level panel data from birth to adulthood and quasi-experimental methods. Higher government spending was associated with higher educational attainment and labor market access. Thus, sufficient expenditure is necessary to ensure that enough teachers, resources and infrastructure are available but beyond a minimum threshold of subsistence resource allocation, the gains to extra resource allocation appear to be limited. Thus, in our view, more important than the level of expenditure is the efficiency of expenditure allocation.

Teacher subject content knowledge

While South African teachers are well-compensated by international standards, they have lower subject content knowledge than their peers in SSA countries.[15] Indeed, they are even sometimes outperformed by learners they are supposed to be teaching. In 2007, when the SACMEQ III tested sixth-grade mathematics teachers, a majority of South African teachers performed below average for the test and struggled with questions that were aimed at learners (Spaull, 2013). The top 5 percent of sixth-grade learners scored a higher mark than the bottom 20 percent of grade 6 teachers in the same mathematics test. South African teachers displayed lower content knowledge than teachers in Kenya, Zimbabwe, Uganda, and Tanzania. This is clearly troubling since teachers cannot pass on knowledge that they themselves do not know.

The relatively weak content knowledge of South African teachers impairs their ability to accurately judge their learners' performance and in turn their ability to improve learner performance (van der Berg and Hofmeyr, 2017). For instance, according to them, primary teachers in the Western Cape province reported that around 80 percent of their students could perform at the required level in home language and numeracy while in fact only 22 of learners actually performed at the provincial level required for satisfactory performance.

Poor schools face environmental challenges that overshadow teacher content knowledge. Spaull (2013) tests the impact of teacher scores in the SACMEQ III survey on learner scores in a linear regression. Contrary to the theories on the economics of education and previous literature findings such as Wößmann (2016), Spaull (2011) finds that teacher knowledge was statistically significant but has a very small impact on learner outcomes. This means that a 100-point increase in teacher test scores would only increase reading and mathematics learner scores by 7.1 points and 4.8 points respectively. Moreover, the coefficients were even smaller when the sample size was restricted to learners from low-income families (Spaull, 2011). Spaull (2011) thus argues that schools in poor communities face environmental challenges

[15] Irving (2002) observes that South African teachers are relatively low paid in comparison to other professions. While this is true, the evidence in data shows that South African teachers are highly paid by global standards.

such as low accountability and poor management that overshadow the impact of teacher knowledge.

Teacher accountability, motivation and absenteeism

In addition to low content knowledge, South African teachers have low rates of accountability and motivation. Studies such as De Ree *et al*. (2015) test the motivation impacts of increasing teacher salaries. The authors used a randomized phase-in design to evaluate the impact of a doubling of teacher salaries in Indonesia and find no evidence of impacts on teacher effort two and three years after the wage reform. This finding is consistent with the fact that South African teachers have low levels of motivation, despite being relatively highly paid (van der Berg *et al*., 2011). On average, a South African teacher misses 11 percent teaching time due to absenteeism (Reddy *et al.,* 2010). According to Irving (2012), 20 percent of teachers are absent on Mondays and Fridays and 33 percent are absent during month end. In predominantly black schools, teachers teach an average of 3.5 hours a day compared with the average of about 6.5 hours a day in former white schools (Irving, 2012).

South African teachers have few systems that make them accountable for the academic performance of learners. Low accountability and teacher effort are often regarded as South Africa's greatest challenge in education (van der Berg *et al.*, 2011). Mbiti (2016) argues that low teacher accountability is a common phenomenon in developing countries. According to Mbiti (2016), spending on education in developing countries and access has been expanding over the past two decades, but accountability is limiting the quality of education, particularly in the rural areas. As is the case in developing countries, the vast majority of South African teachers are public sector workers who are unionized and paid by government.

Mbiti (2016) argues that this centralized system makes it difficult for parents and school principals to hold teachers accountable for political economy reasons. Voting out politicians is a long-term and indirect way of doing this, but often there is an asymmetry in the level of knowledge between teachers and the community, especially in rural areas. Wößmann (2016) finds evidence that school autonomy has positive effects in developed countries but negative effects in developing countries. He thus argues that institutional features in education systems explain a great part of the cross-country variations in learner achievements.

The teaching profession

The pay system in South Africa makes the teaching profession relatively unattractive, especially in the hard science subjects**.** According to Irving (2012), in mathematics and science professions, each year of education adds on average almost 19 percent to wages, compared to 6 percent for teachers. Van der Berg *et al.* (2011) argue that the teacher pay system does not draw any distinction between the quality of teacher performances. Thus, teaching is likely to be an attractive profession for workers at the lower end of the skills distribution, but an unattractive profession for those at the higher end (Irving, 2012). Without reforming the flat-gradient pay system so that the most experienced and best performing teachers are adequately compensated, more of the best teachers will continue to leave the profession mid-career (van der Berg *et al.,* 2011). Moreover, the government is likely to

continue to over-compensate poor performance teachers and have inputs that are not aligned with outputs.

Teacher unions in South Africa have relatively large political influence due to the historical role of unions in resistance movements during apartheid. Unions are the primary intermediary between the government and teachers. According to Irving (2012), over 80 percent of public school teachers in South Africa belong to a union. Teacher unions often have an influence on teacher appointments (Spaull, 2011; Irving 2012). Irving (2012) reports that union meetings occur during school hours and unions often resist school inspection, while Letseka, Bantwini, and King-McKenzie (2012) observe that unions routinely mobilize members to go on strike. Spaull (2011) reports that South African teachers were one of the countries whose teachers did not complete the teacher test section of SACMEQ II. This highlights the role of unions in creating difficulties for the school system to enforce measures of accountability. Moreover, it is also possible that the low rates of teacher effort in South Africa as evidenced by high absenteeism and low content knowledge is a result of the relative comfort that teachers enjoy from union protection.

South African teacher unions have resisted a number of accountability boosting reforms. Teacher unions in South Africa play an unusually key role in accepting and rejecting policy reforms (van der Berg and Hofmeyr, 2017). The scope of South Africa's teacher unions extends beyond teacher salary and benefits to all issues including teacher monitoring systems. Again, this has a historical context. During apartheid, the government exercised authoritarian control over black teachers to achieve social control. Therefore, teacher unions now fervently resist any policy to monitor teachers by blocking accountability reforms.

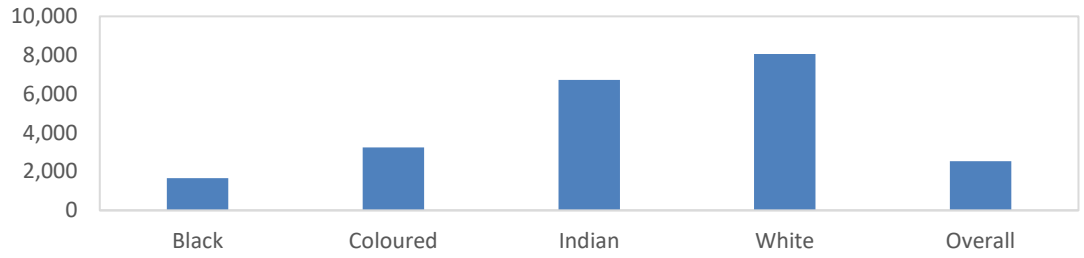
School management

South African schools are run by principals and School Management Teams (SMTs) who have institutional autonomy but exhibit inadequate capacity in fulfilling their tasks.[16] Van der Berg *et al.*, (2011) argue that principals are trained as teachers and then handed with administrative and managerial duties of large and complex institutions. While teachers in formerly white schools also undergo a similar route to becoming principals, these teachers mostly underwent better teacher training, which could partly explain why they become better principals. Moreover, principals in wealthier schools tend to have more qualifications and experience than teachers in poor schools (van der Berg and Hofmeyr, 2017).

Therefore, additional support or training is required to bring principals in schools lagging in performance to the same level of performance as principals in formerly white schools. Moreover, administrative duties assigned to principals often distract them from their central task of leading in teaching. As van der Berg *et al.* (2011) observe, South African principals do not perceive their role to encompass instructional leadership, which is leadership in teaching and covering the curriculum. This possibly partly explains the low levels of teaching accountability in South African schools.

[16] School Management Teams are made up of principals, deputy principals and Head of Departments. The SMT is responsible for administrative and organizational matters of the school.

Figure 18. Household Expenditure on Education by Population Group of Household Head in 2015
(in South African Rands)



Source: StatsSA (2017).

There is also a need to redesign staffing policy to address the unequal distribution of the quality of principals across schools. Van der Berg and Hofmeyr (2017) observe that the best principals end up in wealthier and better performing schools since they prefer to apply to better performing schools, and these schools tend to have more stringent requirements for hiring principals. Thus, policy needs to incentivize or compel better quality teachers to move to poorer and less performing schools.

Income inequality, socio-economic status, and geographical location

Notwithstanding the government's pro-poor school funding policy, where formerly disadvantaged schools have been allocated higher budgets than former Model C schools, public schools in urban areas and those located in richer neighborhoods tend to have more resources per pupil than those in poorer areas, sometimes supplemented by private resources. Although children from low-income families have been exempted from school tuition, with 70 percent of learners now attending zero-fee school (Besharati and Tsotsotso, 2015), other costs such as transport, stationery and uniforms remain burdensome (Spreen and Vally, 2006). Van der Berg (2008) finds evidence that school absence due to unpaid fees was associated with poor learner outcomes.

The fact that poor learners have limited access to education due to financial constraints is highlighted in Figure 18 below. Due to historical reasons, income in South Africa is associated with race and in turn race is associated with education expenditure. In 2015, the average expenditure on education by white households was three times the national average. Black households, on the other hand, had the lowest average annual expenditure, and were the only households to spend less than the national average. This highlights their limited capacity to afford essential education resources such as transport, stationery, and uniform.[17]

[17] Another channel through which socio-economic status might be affecting education is through access to computers. PIRLS (2017) reported that Grade 4 international reading test results displayed a correlation between student reading achievement and access to computer devices at home and at school. Spaull (2013) finds evidence that having experience with using a computer affected learners SACMEQ scores in a linear regression. There are two ways in which these cause and effect might be manifesting. Firstly, computer usage might be helping

In addition to the role that socio-economic status plays in educational outcomes through income channels, it also plays a role through spatial channels. Branson and Leibbrandt (2013a) observe that a majority of South African learners attend schools located in their immediate communities. More than 80 percent of South Africa's dysfunctional schools are located in African townships and rural areas (Letseka, Bantwini and King-McKenzie, 2012).[18] Since dysfunctional schools are concentrated in poor neighborhoods, this means that poor learners are more likely to attend dysfunctional schools.

Thus, socio-economic status plays a major role in determining the level and quality of education for South African learners through income and geographical channels. This has resulted in historical spatial divisions between the rich and poor persisting to the point where outcomes in rural communities are much lower than outcomes in urban areas (Branson and Leibbrandt, 2013). Spaull (2011) reports that 70 percent of South Africa's learners, most of whom are black, attend dysfunctional schools and achieve below national and international standards. Moreover, using SACMEQ III test results, Spaull (2011) finds that grade repetition was more prevalent among learners from poorer backgrounds.

There is a great degree of inequality in outcomes among South African schools. A measure of inequality between schools is the intra-class correlation coefficient rho (ρ). ρ captures the variance in the performance between schools as a proportion of overall variance (Van der Berg, 2008).[19] According to Van der Berg (2008), the ρ for SACMEQ II reading and writing scores in South Africa were 0.7 and 0.64 respectively, confirming that there is a high inequality between schools. The variations between South African schools in rich and urban areas and those in isolated rural poor areas are substantially larger than in other SACMEQ countries. According to Spaull (2011), learners from the most affluent provinces, Gauteng and the Western Cape have better mathematics and science outcomes than learners from the rest of the country.

Using SACMEQ III results, Spaull (2011) demonstrates that group socio-economic status of schools affects learner outcomes more than individual socio-economic status. This results from the high level of homogeneity among learners in the same school or community. This in part explains why such a large part of the impact of socio-economic status on learner outcomes manifests through geographical and spatial channels. The fact that socio-economic status plays out mainly through spatial channels is also highlighted in South Africa's high level of inequality between schools. As discussed above, historical reasons account for a great deal of this inequality. The intra-class correlation coefficient in South Africa exceeds the

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learners develop cognitive skills (numeracy and literacy). Secondly, what Spaull (2013) might have picked up is a socio-economic status effecting educational outcome with computer usage being a proxy for socio-economic status.

[18] It is important to note that this statistic was relates to learner outcomes based on national and international benchmarks at a given point in time. Thus, the statistic overlooks many township schools that have made substantial progress in improving learner outcomes and from which policy lessons could be derived.

[19] Algebraically, this can be expressed as $\rho = \sigma^2_B/(\sigma^2_B + \sigma^2_A)$ where σ^2_B is the between-school variance, and σ^2_A is the within-school variance. A low intra-class correlation, say less than 0.25, indicates relatively small between-school variations.

world average estimated to be between 0.3 and 0.4 (Foy, 2004). Thus, policy needs to address the impact of socio-economic status at a community level.

Language

A majority of South African learners, predominantly black, do not have a good command of the language English even though English is the primary medium of instruction in schools. According to PIRLS (2011), students who rarely spoke the language of the test at home had much lower average reading scores. Spaull (2011) used SACMEQ III results and the frequency with which learners spoke English at home to investigate the effect of proficiency in English on test scores. According to Spaull (2011), learners who always spoke English in their home environment achieved 38 points more than learners who rarely spoke English at home, while learners who sometimes spoke English at home achieved 19 points more. The frequency with which learners spoke English at home was also positive and significant in explaining numeracy and health test scores.

Studies such as Howie (2003) attribute the lagging learner performance of South Africa relative to other countries to a disadvantage in language. The country's learners are taught in their mother tongue during the foundation phase and then transition to English as the medium of instruction around the fourth-grade (Van der Berg *et al.,* 2011). Language affects learning in South African schools through several generative channels including the density of familiar words, code-switching where the time to teach a concept is doubled since the concept has to be explained in two languages, and the fact that most learners do not speak English outside the classroom (van der Berg *et al.,* 2011). However, in South Africa language is associated with socio-economic status, the type of school attended and so on. Thus, it is difficult to disentangle the extent to which the disparity in performance results can be attributed to linguistic disadvantage on the hand and environmental factors on the other (van der Berg *et al.,* 2011).

Textbook availability

The uneven availability of textbooks in South Africa's education system is contributing to deviations in outcomes. Internationally, PIRLS (2017) reports that the number of reading books at home is positively associated with reading test scores. Moreover, average reading achievement in schools with the largest libraries was 525, compared to 494 to 501 for schools with a smaller or no central library. Studies such as van der Berg and Louw (2006), Van der Berg (2008) and Fehrler *et al*. (2009) find evidence that the educational returns to textbooks are large and significant in South Africa's education production function. According to Spaull (2011), learners who have their own textbook or shared a textbook with at most one learner outperformed the rest of the learners in literacy tests but not for mathematics tests. Textbooks might be another channel through which socio-economic status affects performance. Spaull (2011) reports that 37 percent of the 20 percent poorest students do not have a textbook of their own or have to share with at least two more students. At the opposite end of the income spectrum, Spaull (2016) finds that only 15 percent of the richest 20 percent of students have to share a textbook.

B. The Main Take-Aways

Inadequate funding for education is not the key issue. All of the factors that we have highlighted are commonly cited as the key explanatory factors in South Africa's education system. While Murtin (2013) argues that South Africa's primary and secondary education is under-funded, from the input side, the limited availability of textbooks is the only factor that is highlighted in literature. However, given the high level of inequality between South African schools and the fact that socio-economic status impacts learner outcomes mainly through spatial channels, the argument of Murtin (2013) appears to have some validity. While the present level of South Africa's education expenditure is high by international standards, historically underfunded schools might still be suffering from infrastructural and resource backlogs. Nevertheless, most of South Africa's education literature highlights the need to increase the *efficiency* of government spending on education, but usually does not recommend that the level be increased. The major beneficiaries of South Africa's high education expenditure are teachers despite them having poor content knowledge and low accountability. This is often cited as an even more pressing than the challenges in the capacity of school management.

Low accountability from teachers and a flat pay system is limiting the return from a relatively high teacher compensation bill. Teacher pay is relatively high for entry-level teachers but does not compensate for more experienced and more qualified teachers. Moreover, the strong presence of trade unions makes it difficult to implement accountability measures.

Socio-economic status plays a more critical role through geographical channels rather than income channels. This is evident in that enrollment at primary and secondary levels is almost universal, but beyond secondary school, enrollment is higher for more affluent areas. Thus, while poor learners may face some financial constraints in accessing education, the main difficulty is that by living in poorer areas they are more likely to attend dysfunctional schools that do not help them advance to higher levels of education. Finally, it is well established in literature that students are more likely to achieve better outcomes if they are learning in their mother tongues. Hence the fact that a majority of South African learners are taught in a language that they hardly ever speak at home possibly explains a great part of why South African learners are struggling to achieve national and international curriculum requirements. That said, other African countries face similar linguistic challenges, yet achieve better results.

In a comprehensive meta-analysis of educational interventions in South Africa, Beshawati and Tsotsotso (2015) conclude that there is no panacea that universally works in time and space. They note that methodology and study design have a substantial influence on the reported side effects of "treatment". The strongest results that they report are that, in line with child development literature, the strongest predictor of side effects is the school phase. In other words, the biggest impact is at the lowest school levels and results tend to persist over time. At the high school level, they argue that the most impactful and cost-effective interventions arise from well-designed and well-delivered teaching and learning materials. On the other hand, complex and comprehensive "whole school" developmental programs are largely ineffective and costly.

V. Socio-Economic Impacts of Weak Educational Outcomes

A. Economic Growth

South Africa's historically low structural growth may in part be due to poor outcomes in education. To the best of our knowledge, there has not been any published work on the relationship between economic growth and education in South Africa. However, the international evidence provided below seems to indicate that low-quality education has been a drag that partly explains the low long-run growth in the country.[20]

Hanushek and Wößmann (2007) explain that three theoretical channels through which this happens. Firstly, as neoclassical growth literature has demonstrated, education leads to a more skilled workforce, higher productivity of human capital and higher output.[21] Secondly, as the endogenous growth literature argues, education increases the innovation in the economy, with new products, new knowledge and new processes that can drive economic growth.[22] Finally, education facilitates the diffusion and transmission of knowledge needed to understand new information and implement new technologies which promote economic growth.[23]

This is the case in Barro (2014) who investigates the determinants of economic growth and investment. In a panel of around 100 countries between 1960 and 1995, he finds that growth is positively related to the starting level of average years of school attainment at the secondary and higher levels. At the primary level, the education is insignificant. However, since primary education is a prerequisite for higher levels of education, primary education does impact growth. Agiomirgianakis, Asteriou and Monastiriots (2002) use panel data for 93 countries and find that education affected economic growth through the human capital factor. Krueger and Lindahl (2009) calculate the average years of schooling from the World Values Surveys (WVS) for 34 countries and a cross-country growth equation and find that change in education is positively associated with economic growth once measurement error in education is accounted for.

Studies such as Wößmann (2016) have found that the cross-country differences in educational achievements explain a great part of the variations in GDP per capita growth rate. Wößmann (2016) shows that a model with countries' average years of schooling and their initial level of GDP per capita only explained a quarter of the total cross-country variation in growth rates in GDP per capita from 1960 to 2000. When the author included international achievements tests between 1964 and 2003, the model explained three quarters of variations in GDP per capita growth rates. This highlights the importance of the quality of education over and above the quantity of education on the economy as demonstrated by Branson and Leibbrandt (2013a).

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[20] South Africa has experienced low structural growth rate since the 1970s (see World Bank, *Systematic Country Diagnostics*, 2018). The high growth rates in the early 2000s were in part a result of the post-apartheid reform dividend as well as the commodity boom.

[21] See Mankiw, Romer, and Weil (1992).

[22] See Lucas (1988); Romer (1990).

[23] See Nelson and Phelps (1966).

Wößmann (2016) argues that the differences in mathematics and science scores explain the high economic growth rates of the East Asia miracle countries and the sluggish growth rates of Latin America.

B. Employment

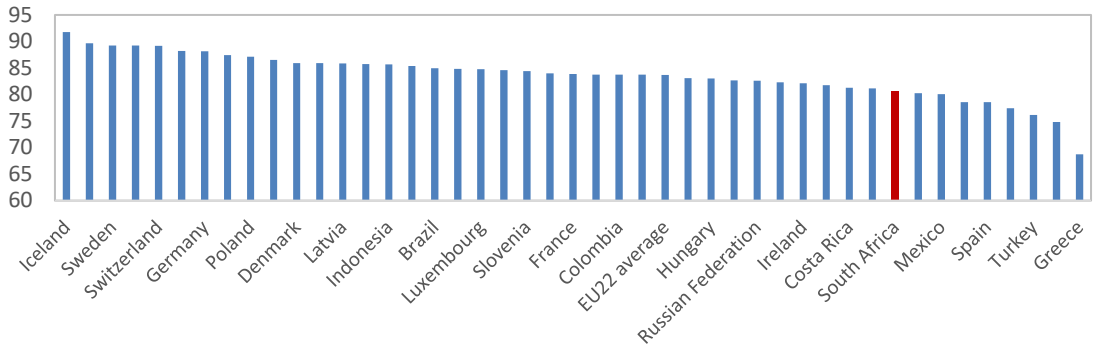
The level of educational attainment in South Africa explains a great part of the variations in employment and unemployment rates across population groups.[24] While the overall employment rate in South Africa is substantially lower than in higher and middle-income countries, South African tertiary graduates experience employment rates comparable to those in affluent countries. As illustrated in Figure 19 below, 81 percent of South African tertiary graduates were employed in 2015. This is comparable with the OECD average of 84 percent. On the other hand, Figure 20 below shows that South Africans with less than primary school completed have the highest unemployment rates while graduates have the lowest unemployment rates. According to the OECD (2017), the difference in employment rates between tertiary graduates and those who only had an upper secondary education is 21 percentage points in South Africa, more than twice the average gap in OECD countries of 9 percentage points.

The variations in the level of education of South African workers explain a great part of variations in employment prospects. Branson and Leibbrant (2013b) investigate the relationship between the level of education completed and employment probability for 15–64-year-old individuals using data from national cross-sectional household surveys spanning from 1994 to 2010 in a linear probability model. They find evidence that the increased propensity to be in employment was higher for those that have some secondary, matric and tertiary education than for those with primary or less than primary education. Moreover, the employment probability premiums to tertiary education are high and have increased over time. Moses, van der Berg, and Rich (2017) also observe that below grade 11, the returns to education are small but increase dramatically for grade 12 and beyond.

South Africa's economic growth in the early 2000s was skills-intensive and benefited highly educated workers at the expense of lowly educated workers. When controls in the form of a population group, and household and urban residences are included in their model, Branson and Leibbrant (2013b) find no employment premiums to lower levels of education. Similar to Moses, van der Berg and Rich (2017), Branson and Leibbrant (2013b) argue that this is testament of South Africa's skills-biased growth in the early 2000s. During this period, the share of employment in primary sectors such as mining, and agriculture declined from 33 percent to 11 percent while the share in the financial sector increased from 3 percent to 11 percent (Banerjee *et al.*, 2008). Additionally, the employment share of the service sector increased from 9 percent to 25 percent (Banerjee *et al.*, 2008).

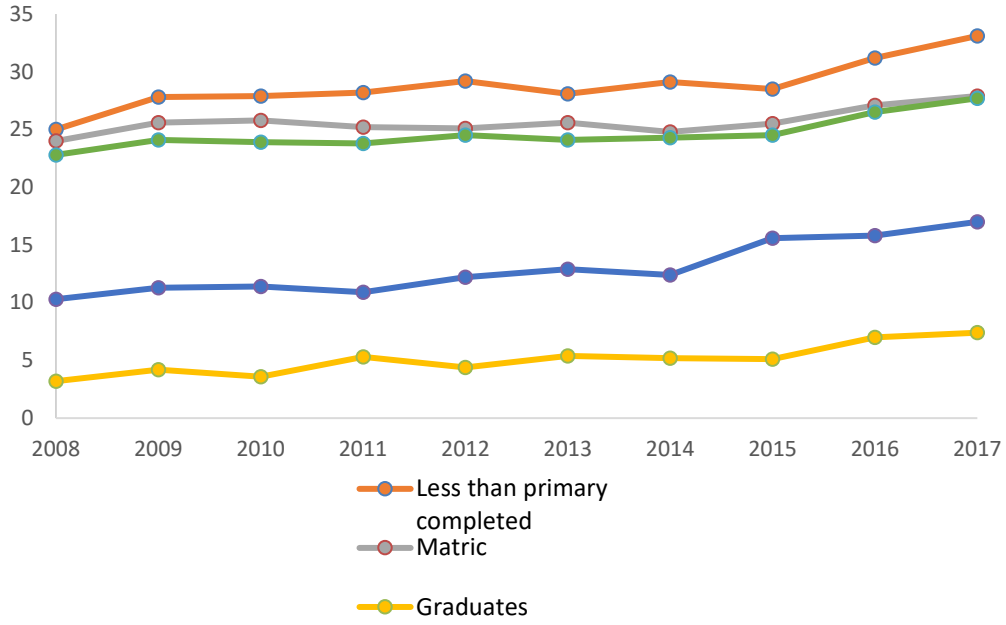
[24] In this paper, unemployment is based on the narrow definition of the International Labor Organization (ILO). According to this definition of unemployment, working age individuals are part of the labor force if during a week of reference, they were employed or wanted to work and were available to start working within a week but also had actively looked for work during the past four weeks.

Figure 19: Employment Rates of Population Aged Between 25 and 64 Years Who are Tertiary-Educated in 2015



Source: OECD (2015).

Figure 20: Unemployment Rates by Level of Education for the Period 2008 to 2017



Source: Stats SA (2017).

There is a misalignment of the output in education and demand trends in employment. Banerjee *et al.* (2008) argue that the sluggish growth in employment in the early 2000s was as a result of structural changes in the economy. Completion of primary education expanded more rapidly than completion of tertiary education while the share of employment in the primary sectors declined at the expense of the share in tertiary sectors. The composition of labor became more skill intensive benefiting the highly educated at the expense of the lowly educated. The output of education in South Africa has thus been misaligned with trends in the demand for labor.

South Africa's highly educated workers are more likely to retain their jobs. Anand, Kothari and Kumar (2016) analyze the determinants of high unemployment in South Africa by studying labor market dynamics using individual level panel data from the Quarterly Labor Force Survey. The authors use stock-flow equations and counterfactual exercises to compute the roles of different transition rates on unemployment and find that education was associated with lower job-exit rates. This means that individuals with higher education were less likely to transition from employment to unemployment. Thus, education is important for job security. They also find that blacks had higher job exit rates. This finding is consistent with the education trends among racial groups.

Education level *per se* in South Africa plays a significant but minor role in finding employment. Anand, Kothari and Kumar (2016) also investigated the role of education in the probability of transitioning from unemployment to employment and find that education played a relatively minor role in job-finding rates, with experience playing the larger role. This is likely due to the fact that South Africa's primary and secondary education lags in quality and provides a weak signal of productivity for a potential employee (Anand, Kothari and Kumar, 2016).

Theoretically, the quality of education, more than the quantity of education, is an important determinant of labor market outcomes**.** Firstly, the quality of education that a learner receives affects their ability to proceed to higher levels of education which in turn might affect employment prospects. Secondly, even when the level of education is controlled for, school quality affects the ability of an individual to search for a job or maintain a job.

In South Africa, returns to education appear to be insensitive to the inclusion of quality measures. Branson and Leibbrandt (2013a) test the impact of the quality of education attained on labor market outcomes by including quality measures to a standard Mincerian regression.[25] For individuals whose highest level of education is matric, the quality of education provides an important productivity signal to a potential employer. However, in most cases, the quality of South Africa's basic education is often too low to provide a reliable productivity signal for employees. This means that school quality differentiates workers in ways that are not immediately apparent to the employer but materialize once the worker is employed. This finding is consistent with Moses, van der Berg, and Rich (2017) who observe that the low quality of education also accounts for the low returns of education below matric level.

C. Earnings, Inequality, and Poverty

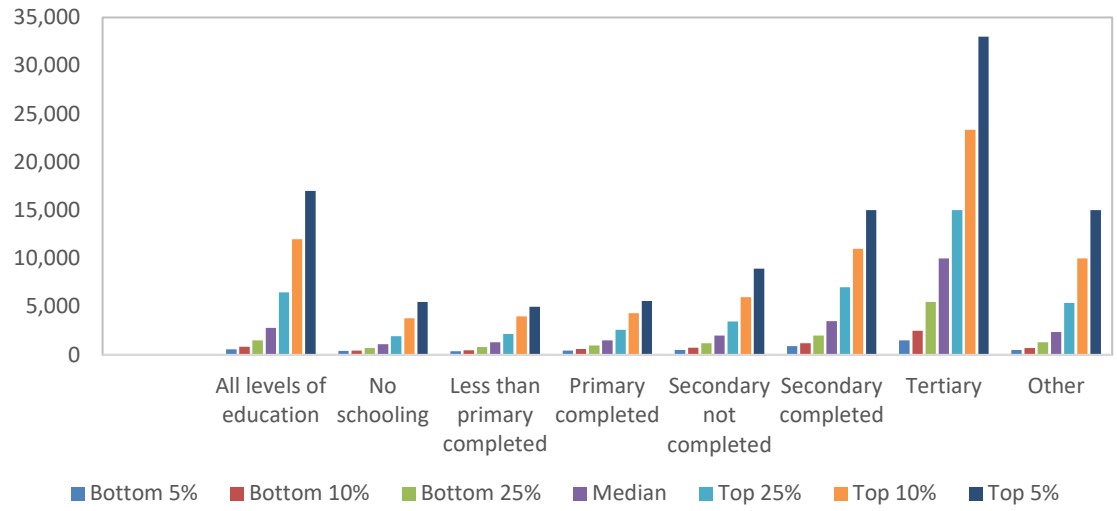
The South African education literature has demonstrated that earnings are closely associated with the level of education. Branson and Leibbrant (2013b) investigate the relationship between the level of education completed and monthly earnings for South Africans over time using a basic semi-log linear regression. Similar to the findings of Moses, van der Berg, and Rich (2017), they argue that the relationship between educational attainment and wages in South Africa is convex with limited returns to additional years of schooling below grade 12,

[25] A Mincerian regression is a single-equation model that explains wage income as a function of schooling and experience.

but high from this level and beyond. Branson and Leibbrant (2013b) also find that earnings premiums to tertiary education are high and increased during their period of investigation. Completing matric or enrolling for secondary education has positive and significant effects on wages although the premia for these levels of education remained constant over time.

The variations in income are sensitive to the quality of education. As discussed above, Branson and Leibbrandt (2013a) argue that school quality impacts the level of education that an individual achieves. Thus, they extend the analysis of education's impact on wage premiums by including quality measures as explanatory variables in a standard Mincerian regression. School quality impacts earnings directly through its impact on the quality of the worker. The authors find evidence that the matric score and the pupil-to-teacher ratio, given a respondent's closest school, has an impact on earnings. A 10 percent increase in the matric score increased the earnings premium by an average of 8 percent while decreasing the ratio of pupil to teacher by one learner increased the earnings premium by an average of 1 percent.

Figure 21: Distribution of Monthly Earnings by Education in 2010
(in South African rands)



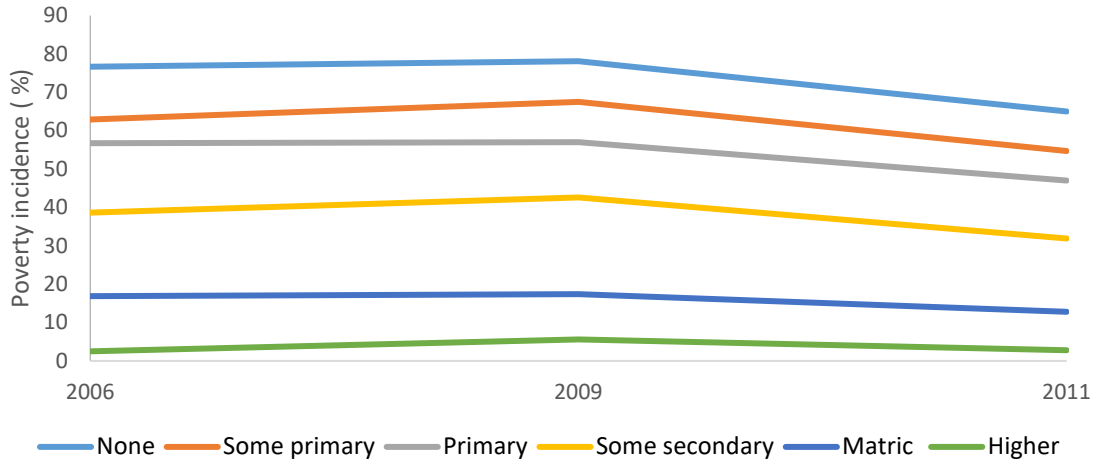
Source: Stats SA (2010).

Individuals whose highest level of education was primary school and tertiary education were most affected by school quality inclusions. According to Branson and Leibbrandt (2013a), this is due to the fact in a good primary school, learners exit with basic numeracy and literacy skills whereas in a bad quality primary school, learners do not attain even the basic cognitive skills. For individuals with higher education, school quality in the form of matric scores affect the type of higher education institution that the learner can enroll for, i.e., higher certificate, diploma or degree, which in turn affects the individuals' wages upon finding employment. Van der Berg (2005) also finds evidence that a major part of South Africa's residual earnings

differential that is associated with labor market discrimination is as a result of variations in educational quality.[26]

Education reduces income inequality and poverty through the unemployment and earnings channels**.** Education has an effect on unemployment which in turn has an impact on income inequality. Education also affects the incomes of those who are employed and thus affects income inequality. Anand, Kothari, and Kumar (2016) estimate that a 10-percentage point reduction in unemployment lowers the Gini coefficient by 3 percent. The authors observe that achieving a similar reduction solely through transfers would require a 40 percent increase in government transfers. South Africa's high Gini coefficient of 65 percent in 2016 (World Bank, 2016) and racialized poverty thus highlight the bimodality of South Arica's education system. Persistent disparities in the levels and quality of education across race and socio-economic status mean that the South African economy will continue to be plagued by high levels of racialized horizontal inequality and racialized poverty incidence (Spaull, 2011; 2013). Moreover, poverty incidence in South Africa continues to be concentrated in rural and predominantly black communities that have dysfunctional schools (Moses, van der Berg and Rich, 2017)

Figure 22: Poverty Incidence of Households by Education Level of Household Head



Source: Stats SA (2014).

VI. POLICY CONSIDERATIONS

Given the foregoing discussions, this section primarily relies on a few key papers to highlight possible policy interventions that can improve the quality of education in South African schools. These include the work of Spaull (2011; 2013), Mbiti (2017), Evans and Popova (2016), and Van der Berg *et al.* (2011) Some intellectual modesty is appropriate since there is no universal panacea. The policy considerations are divided into four main categories. The

[26] Labor market discrimination occurs when there are different earnings and employment opportunities across equally skilled workers employed in the same occupation because of attributes such as race, gender, nationality, age and so on.

section begins with teacher-side interventions, moves on to management-side interventions, parent-side interventions, and concludes with other considerations.

A. Teacher-Side Interventions

Capacity building

South Africa's policymakers should consider implementing more intensive, continuous, and localized teacher training. McEwan (2015) performs a meta-analysis of 77 studies that investigated the impacts of various educational interventions and finds that teacher training improved learner outcomes. Evans and Popova (2016), through a comprehensive narrative review of empirical studies looking at educational interventions in developing countries, find that the teacher training interventions have large impacts on learner outcomes and that they work best when completed with other interventions. They argue that teaching interventions such as introducing flash cards to teach English in India had the largest impact when accompanied by teacher training. Moreover, localized long-term teaching programs have larger impacts than training programs that happen one time. This is supported by the finding by DoBE (2019). The report finds that based on SACMEQ 2007 and 2013 data, the younger generation of teachers who are being trained in the university-based system since the year 2000 have better subject knowledge.

Pedagogical interventions have the potential to boost learner outcomes. Evans and Popova (2016) and Conn (2017) observe that interventions with adaptive instruction methods had the largest impacts on learner performance. Moreover, Conn (2017) argues that most interventions work best as complimentary interventions for improvements in pedagogical methods. According to Evans and Popova (2016), most interventions with adaptive instruction methods take place either through computer-assisted learning or teacher-led methods that are focused on formative assessment and targeted instruction.[27] They observe that the latter intervention to have the largest impact on learner performance.

Despite the finding made by Spaull (2011) that access to computers is associated with better learner outcomes, teacher-led interventions appear to be a better option for South Africa given that they have a larger impact and are more affordable and more easily scalable than computer-assisted learning programs. In Gauteng province, a pedagogical intervention in the form of the Gauteng Primary Language and Mathematics Strategy (GPLMS) was introduced to improve learner outcomes in 2014. The GPLMS encompassed scripted lesson plans, provision of high-quality instructional materials and conventional teacher training with one-on-one instructional coaching (Fleisch *et al.,* 2016). Fleisch *et al.* (2016) investigate the impacts of the GPLMS and find that the intervention improved the numeracy scores of learners.

[27] Evans and Popova (2016) list two examples of teacher-led adaptive instruction methods. The first is the Early Grade Reading Assessment program in Liberia where the reading levels of learners were evaluated using a diagnostic exam, and teachers were then trained in how to continually assess student progress. The second example is the assigning of Kenyan learners to classes on the basis of initial preparedness so that teachers could focus instruction at the level of learning of the students.

Performance pay

Increasing accountability by transforming South Africa's teacher pay system from a flat pay system to a performance-pay may improve learning outcomes. Theoretically speaking, teacher performance pay can impact learner performance in two ways. Firstly, teachers might be motivated to teach for longer hours, improve their teaching methods, develop more content knowledge and embark on professional development. Secondly, the best teachers will be incentivized to join the teaching profession (Yuan, *et al.*,2015). Van der Berg *et al*. (2011) propose restructuring the teacher pay system so that it incentivizes good teaching and attracts the best candidates into the teaching profession.

There is considerable international evidence to support performance pay. Wößmann (2011) investigates the impact of performance-related pay on student performance using PISA 2003 data and performance pay data from 28 OECD countries to estimate a student-level international education production function. The author finds that the use of teacher pay salary adjustment for outstanding performance is significantly associated with math, science and reading achievements. He finds that students that make use of teacher performance pay perform significantly better in math, science, and reading than those that do not. Duflo, Dupas and Kremer (2011; 2012) and Muralidharan and Sundararaman (2013) evaluated the impacts of such a policy move in Kenya and India, respectively, and find the positive and significant impact on learners' performance. Evans and Popova (2016) observe that accountability measures in the form of performance incentives have been reported to have large impacts on learner outcomes.

South Africa's incentives could be designed to attract teachers to poorer performing schools. Van der Berg and Hofmeyr (2017) report that teachers who move tend to move to better performing schools and given the association between the school quantile and performance, these schools tend to be in a higher quantile. The extent to which teachers are motivated by the perception that better performing schools make teaching easier is unclear. Teacher pay incentives could be targeted at remotely located schools that tend to underperform in order to attract good teachers.

The performance pay could reward teachers based on learners' performance using National Integrated Assessment Framework (NAIF) scores that are externally moderated.[28] While this might limit the willingness from teachers to claim the incentive as some teachers believe that learner performance is affected by environmental factors outside their control, it is likely to be more effective than rewarding teachers based on teacher test scores. Content knowledge is a necessary but not sufficient condition for improved outcomes. Teachers might have the right content knowledge, but they still have to be incentivized and motivated to be accountable and professional and deliver the content in an effective way.[29]

[28] The NAIF is the Department of Basic Education's new model of national assessments, which was piloted in October 2017. It replaced the Annual National Assessments (ANAs). The new model will be sample-based and administered in Grades 3, 6 and 9 once every three years.

[29] A performance-pay system that is based teacher content has been introduced in countries such as Chile and Brazil (van der Berg *et al.*, 2011). Government could enforce the teacher tests. While enforcing the teacher tests

B. Management-Side Interventions

School Management

There is a need to clarify the role and duties of South African school principals. Van der Berg *et al.* (2011) observe that South African principals view their role to be predominantly managerial and administrative. Principals' roles should be extended to include instructional leadership and assessed on this merit. One way to assess the performance of principals in instructional leadership would include assessing how well the curriculum was covered. Moreover, the South African education system needs to ensure that the very best teachers become principals by using teacher performance indicators.

As is the case with teachers, a challenge with making principals accountable for learner performance is that principals cannot fully control environmental factors that affect learner performance. Poorly performing principals should be given targets to meet and be replaced with the directive of all stakeholders when targets are not met (Van der Berg *et al.*, 2011). This policy recommendation assumes that competent principals in schools lagging in performance should be able to improve learner performance to a certain level irrespective of environmental factors.

C. Parent-Side Interventions

Greater community involvement

School Governing Bodies (SGBs) are a good opportunity for parents to be involved in their children's education.[30] Van der Berg *et al.* (2011) observe that the great improvement in educational attainment in East Asia is due to the right attitudes and participation from parents in their children's schooling. In South Africa, SBGs have a legislative mandate in the running of schools. While their role is often limited by inadequate expertise, particularly in poor communities, SBGs provide a good opportunity as a platform for parents to be more involved in issues of education. Thus, van der Berg *et al.* (2011) argue that SGBs should be provided with additional support to capacitate them to fulfill their role. A challenge with this policy is that very few parents form part of the SGB and thus the scale of impact is limited.

A possible measure to make all parents take interest in their children's education is to require periodic meetings with teachers to review children's performance. Such meetings could take place biannually. While quarterly performance reviews are given to parents, little is known about their influence on parent's involvement in children's education since many of the report

might make entering the teaching profession unattractive, it actually provides a useful filter of who enters the profession.

[30] The SGB is a statutory body of parents, educators, non-teaching staff and learners (from Grade 8 or higher) who seek to work together to promote the well-being and effectiveness of the school community, and thereby enhance learning and teaching. The SGB makes decisions regarding the admissions policy for the school, the language policy of the school, and a code of conduct for learners which sets out disciplinary procedures. The SGB is also responsible for adopting a constitution setting out how the SGB will operate and making recommendations regarding the appointment of educators at the school.

cards are not delivered to parents. A face to face meeting between parents and teachers is likely to induce more intervention from parents since it also allows teachers to report to parents about children's effort in class in more detail.

D. Other Interventions

External moderation of the National Integrated Assessment Framework

Systematically using externally assessed tests, such as the NAIF would increase transparency and accountability. As per Van der Berg *et al.* (2011) and Spaull (2013), these national assessments should be externally moderated to avoid discrepancies that may come with cheating and lenient marking. The authors suggest that at least primary exit assessments be externally validated to provide at least one measure of the quality of primary schools. This would supplement TIMSS fourth-grade results by offering quality measures to other subjects in addition to mathematics. As van der Berg *et al.* (2011) argue, externally evaluating sixth-grade results would place a great burden on the budget of the education system. However, this is a more efficient allocation than previous practices. Moreover, the presentation of national assessments such as NAIF results to parents and the SGB could be improved so that parents have better information about their children's performance (van der Berg *et al.,* 2011). The results report could contain information about the child's performance relative to other learners and other schools in the neighborhood.

Language

The quality of teaching English in the foundation phase needs to be improved. Many of South Africa's learners do not use English as their language of communication in their homes. Additionally, support material to teachers and learners in the transition to using English as the medium of instruction needs to be expanded. Government policy had been neglecting this potential low hanging fruit until the Curriculum and Assessment Policy Statement (CAPS) set minimum requirements on the number of hours English must be taught as the First Additional Language (FAL) in the foundation of phase. Moreover, van der Berg *et al.* (2011) propose that government could assign specialist English teachers to each school to improve the quality of the English that is taught at the foundation phase.

Early Childhood Development

Improving the access and quality of Early Childhood Development (ECD) programs has the potential to boost learner performance. Spaull (2013) makes this recommendation while van der Berg *et al.* (2011) propose that ECD programs be provided with additional material support and pedagogical training. Additional monitoring of the programs could be conducted by specialists at a district level. This will help ensure that quality education sets South African learners on a path to good academic achievement is provided in the early stages of development. Intervening as early as possible is a cost-effective solution in a resource-constrained society (Moses, van der Berg, and Rich, 2017).

Low hanging fruits

Policy interventions that can improve education in South Africa include low hanging fruits such as increasing the access to good quality textbooks and increasing the frequency of homework. Providing every learner with a textbook that is a low-cost policy move that is easy to administer and has large potential to positively impact learner performance (Spaull, 2013). Van der Berg (2008) and Spaull (2013) find evidence that the frequency of homework improved learner performance.

E. Summing Up

Given the high number of possible interventions to improve educational, it is often difficult to see the forest for the trees. Conn (2017) performs a comprehensive meta-analysis of 12 types of educational interventions in SSA and find that changes in instructional or pedagogical methods have a strong and robust effect on student performances. Evans and Popova (2016), who do one of the most extensive reviews of educational outcomes internationally, propose three areas of broad consensus in the literature. These areas of intervention are the most promising: (i) pedagogical interventions that match teaching to students' learning, including through the use of technology; (ii); individualized, long-term training for teachers; and (iii) accountability-boosting measures. Murnane and Ganimian (2014) perform a narrative review of 115 impact evaluations of educational interventions in low- and middle-income countries, and find that well-designed teacher incentives, teacher capacity building for low-skilled teachers have large and significant impacts on learner outcomes. All these are relevant for South Africa and they have been discussed above.

VII. Concluding Remarks

This paper set out to undertake a selective narrative review to explore the causes of the relatively low educational quality in South Africa and analyze its socio-economic impact. While there is a global phenomenon of weak correlation between spending on education and the quality of educational outcomes, South Africa's basic education system has poorer outcomes than that of peer countries with lower spending per capita on education. Increased spending has undoubtedly expanded the access to primary and secondary education, especially for the historically disadvantaged groups. But while there have been some notable improvements since 1994, the quality of education continues to limit South Africa from realizing economic returns on its education expenditure. Thus, a pressing policy question on South Africa's education system is how resources can be used more efficiently to achieve a better quality of outcomes.

The review conducted in this paper does not pretend to be exhaustive, but it does draw on other more comprehensive and authoritative ones, including reviews of reviews. Our main objective is more modest: to provide in one place various metrics of educational quality at the primary, secondary, and tertiary levels in order to inform a constructive debate. It looks at both input and output metrics, and systematically benchmarks South Africa against both its regional and international peers.

It is safe to say that there is no panacea for improving outcomes in South Africa's education system. However, there are parallels between South Africa's challenges in education and the policy dilemmas of other developing regions. Some of the policy suggestions found in South African literature match the findings by Evans and Popova (2016) based on a comprehensive review of international studies in developed countries. They find that three broad categories of intervention—(i) pedagogical interventions that match teaching to students' learning; (ii) focused long-term teacher training associated with a particular method or task; and (iii) accountability-boosting measures such as teacher performance incentives—have the largest impact on learner outcomes. This is consistent with the findings of Conn (2017), who undertakes a meta-analysis of education interventions in SSA and finds that pedagogical interventions had the greatest impact on learner outcomes.

Increasing government spending on education will not unconditionally improve learner outcomes, without paying attention to how the money is distributed and effectively utilized. Studies such as van der Berg and Hofmeyr (2017) observe that the resource shift in recent decades did not eliminate infrastructural backlogs. Since South African schools exhibit a high level of spatial inequality, there is a need to conduct more robust studies on how resources are distributed within South Africa's education system. These studies should aim to enable policy makers to identify any backlogs in infrastructure and resources in schools located in poorer communities.

Nevertheless, as Murnane and Ganimiam (2014) and Mbiti (2017) argue, it is clear that throwing more money at the problem—without accompanying measures—is almost never the answer. While cost-cutting interventions, e.g., fee reductions, do improve enrollment and attendance, the literature shows that they do little to improve student learning outcomes on their own. This is most likely to be the outcome of the recent introduction of free tertiary education for most students. Without addressing the weak foundations at the primary and secondary school level, the payoff of free tertiary education is likely to be limited at best, and wasteful at worst. Unfortunately, political economy considerations usually favor these types of intervention because they are visible and can be more easily "captured" by politicians.

The impact of each intervention usually hinges on its design and implementation. Each of the policy considerations that we have discussed in this paper requires additional research to understand the full implications for the South African case. For instance, performance-pay would require policy makers to carefully determine the level of the incentive and decide on whether it will be awarded on an individual or collective basis. And some interventions work best when complemented with others (Evans and Popova, 2015; Conn, 2017). Thus, it is important to think of an optimal combination of interventions instead of isolated interventions. Finally, for South Africa, there seems to be low-hanging fruits such as making textbooks available and increasing the frequency with which learners are assigned homework. These interventions are easy to implement in the short run, while policy makers plan on implementing more complex long-term measures.

In line with weaknesses inherent in narrative reviews, the studies reviewed in this paper are based on our discretion and there is inevitable subjectivity in the findings on what seems to work and what does not. A meta-analysis would presumably yield more objective and

quantified impact assessments. Although we do draw on meta-analysis findings by Besharati and Tsotsotso (2015), we found their results rather too specific and state-contingent to inform a general debate in South Africa. As a result, the extent to which the interventions that they find impactful can be successfully scaled up is difficult to assess or generalize.

Appendix I. Data Sources

Data	Source
Expenditure on education	World Bank (2017): https://data.worldbank.org/indicator
Education enrollment trends	Barro-Lee (2015): http://www.barrolee.com
Education enrollment levels	OECD (2016) Education at a Glance 2016: http://download.ei-ie.org/Docs/WebDepot/EaG2016_EN.pdf
Average Years of Schooling in South Africa	Stats SA (2016) Education Series Volume III: Educational Enrollment and Achievement
TIMSS Test Results	TIMSS (2015): https://timssandpirls.bc.edu/
PIRLS Test Results	PRILS (2017): http://timssandpirls.bc.edu/
SACMEQ Test Results	SACMEQ (2017) : http://www.sacmeq.org/sacmeq-projects/sacmeq-iii/reports#
First Time Upper Secondary Graduation Rates	OECD (2016). Education at a Glance 2016
Government expenditure per tertiary student as a percentage of GDP per capita	World Bank (2018): https://data.worldbank.org/indicator/SE.XPD.TERT.PC.ZS
University Rankings	Times Higher World University Rankings (2017) https://www.timeshighereducation.com/
Employment Rates for Tertiary Graduates	OECD (2016). Education at a Glance 2016
Unemployment Rates by Level of Education	Stats SA (2017) Quarterly Labour Force Survey, Statistical release P0211.
Distribution of Monthly Earnings by Education	Stats SA (2010) Monthly earnings of South Africans Statistical release P0211.2.
Poverty Incidence	Stats SA (2014) Poverty Trends in South Africa: An examination of absolute poverty between 2006 and 2011.

Appendix II. Methodologies for Comparative Metrics

PIRLS and TIMSS

The PIRLS reading achievement scale is an overall measure of reading proficiency that includes both reading purposes and processes of comprehension. The TIMSS mathematics and science assessments are based on comprehensive frameworks developed collaboratively with the participating countries.

Each country participating in PIRLS and TIMSS needs a plan for defining its national target population and applying the PIRLS and TIMSS sampling methods to achieve a nationally representative sample of schools and students. The development and implementation of the national sampling plan is a collaborative exercise involving the country's National Research Coordinator (NRC), and PIRLS and TIMSS sampling experts. PIRLS and TIMSS employ a two-stage random sample design, with a sample of schools drawn as a first stage, and one or more intact classes of students selected from each of the sampled schools as a second stage.

To meet the standards for sampling precision required for PIRLS and TIMSS, national student samples should provide for a standard error no greater than 0.35 standard deviation units for the country's mean achievement. This standard error corresponds to a 95 percent cent confidence interval of ±7 score points for the achievement mean and of ± 10 score points for the difference between achievement means from successive cycles (e.g., the difference between a country's achievement mean on PIRLS 2011 and PIRLS 2016). Sample estimates of any student level percentage estimate (e.g., a student background characteristic) should have a confidence interval of ± 3.5 percent cent.

For most countries, the PIRLS and TIMSS precision requirements are met with a school sample of 150 schools and a sample of 4,000 students for each target grade. Depending on the average class size in the country, one class from each sampled school may be sufficient to achieve the desired student sample size. For example, if the average class size in a country were 27 students, a single class from each of 150 schools would provide a sample of 4,050 students (assuming full participation by schools and students). Some countries choose to sample more than one class per school, either to increase the size of the student sample or to provide a better estimate of school level effects.

PISA

PISA is a worldwide test by the (OECD) in member and non-member nations intended to evaluate educational systems. It measures 15-year-old school pupils' scholastic performance in mathematics, science, and reading. It was first performed in 2000, and then repeated every three years. Its aim is to provide comparable data with a view to enabling countries to improve their education policies and outcomes. It measures problem solving and cognition.

A total of 65 countries participated in PISA 2012 where students took a standardized two-hour handwritten test. Part of the test is multiple-choice, and another part involves fuller answers**.**

South Africa, along with 15 other countries, participated in TIMSS 2011 but did not participate in PISA 2012.

In such a case, the following method is used to derive scores comparable to the PISA scale from the TIMSS results. TIMSS data are rescaled so that the group of 28 countries that participated in both PISA 2012 and TIMSS 2011 has the same mean and standard deviation at the student level on the PISA test. From this re-scaling, educational achievement data on the PISA scale are derived for the 16 countries, which allows for calculating the required means and shares of educational achievement.

SACMEQ

The target population is defined as “all pupils at the Grade 6 level who are attending registered government or non-government schools of the country”. Grade 6 was chosen as the target population because it is the grade level where the basics of reading should have been acquired, and all pupils should be able to read with comprehension. Additionally, for nearly all countries in the sub-region, Grade 6 is the penultimate grade of primary school at which pupils are beginning to prepare themselves for the primary school leaving certificate and for transition to secondary school.

A stratified two-stage sample design is used. Schools are selected at the first stage with probability proportional to the Grade 6 enrollment. Each NRC first prepares the sampling frame data for primary schools in each country. About 150 schools are selected using a random procedure which ensures that data gathered in each country would provide valid information at national and regional levels. Pupils are selected at the second stage within sample schools by drawing a simple random sample of 20 pupils across all Grade 6 classes in the school.

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