Investigating the performance of independent schools in South Africa

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Introduction

Traditionally, the independent school sector in South Africa has been perceived to be "white, affluent and exclusive" (Hofmeyr and Lee, 2004: 143). An associated perception is that independent schools offer a higher quality of schooling than public schools. This report interrogates these perceptions and shows them to be either incorrect or too simplistic. Firstly, although independent schools serve a more affluent body of learners on average compared to public schools, the majority of learners in this sector are black and there are significant numbers of middle to low fee independent schools. Moreover, although independent schools do perform better on average than public schools, according to the measures used in this report, it cannot be unequivocally said that independent schools are more effective than public schools once other school characteristics are taken into account, most notably socio-economic status. A potentially important feature of this report is that it finds tentative evidence that amongst the historically black part of the school system, independent schools perform better than their public sector counterparts at given levels of socio-economic status and funding per learner.

The first section of the report provides a review of international research on the relative effectiveness of independent schooling. Thereafter, the report analyses the relative performance of the independent school sector, beginning at a fairly descriptive level and culminating with some multivariate regression analysis.

Section 1: International evidence on the relative effectiveness of private schools

Over half a century ago, the economist Milton Friedman (1955) proposed that vouchers be given to parents so that they would be able to enrol their children in private schools instead of public schools. This proposal, which has been implemented in various contexts, notably in parts of Latin America, is premised on the view that private schools are more effective at producing student achievement than public schools. A vast literature interrogating this assumption has subsequently burgeoned. Much of this literature has focused on developed countries, although more recently a considerable amount of research has been documented examining the relative effectiveness of private schools in developing countries. The relative effectiveness of private schools, or the "private school effect", can be understood as the performance advantage of private schools over public schools holding student socio-economic status (SES) and other home background characteristics constant. Private schools are also often touted as being more efficient than public schools, i.e. that they are able to produce the same level of student outcomes at a lower cost.

There are several theoretical reasons to expect private schools to be relatively more effective at producing student outcomes than public schools, and why they may be expected to do so at lower costs. Kingdon (1996: 58) points to three such reasons. The accountability of schools to parents is usually stronger in private schools due to the fees that are charged, and this accountability translates into harder work to satisfy parental expectations regarding the quality of instruction. A related reason is that competition amongst private providers of education can be expected to produce higher quality. Thirdly, it is often held that the decentralised management structures, which characterise private schools, are more conducive to efficiency. Conversely, the management structures that are often present in government schools can produce low efficiency and staff motivation.

This section reviews the developing country literature on the relative effectiveness of private schooling. Most of these studies are based on the Latin American context, largely because the extensive voucher programmes that have been implemented there have provided data appropriate for estimating the so-called "private school effect". A very good study was done by Kingdon (1996) on the relative effectiveness of private schools in India. This provides an insight into private schooling in the developing world outside of Latin America. However, there is a lack of research comparing private schools and public schools in Africa and South Africa. The research in this paper is therefore located in fairly unchartered territory, although the findings should be regarded as suggestive rather than definitive, due to data limitations, as will be discussed in the next section.

1.1) Research from Latin America and India

A number of studies on the relative effectiveness of private schools have drawn on the Chilean case. Chile is unique because it has had a universal voucher system in place since the early 1980's. All children have the opportunity to attend public schools or private schools, which the government subsidises with vouchers on a per-student basis. Private schools have the option of charging fees, although this means that schools forgo a proportion of the voucher depending on the level of fees charged. The result is that schools in Chile can be grouped into four categories, as Anand *et al* (2009: 372) describe. Non-voucher fee charging private schools are completely financed by fees and receive no subsidy. Fee-charging private voucher schools are financed by a combination of fees and vouchers received from government. Free private voucher schools are completely financed by government vouchers although they are privately owned and managed. Finally, public schools are financed, owned and managed by the municipal authorities. Some studies also distinguish between religious and non-religious private schools (e.g. McEwan and Carnoy, 2000). Since the reforms of the 1980's the private schools sector has expanded considerably. In 2002, non-voucher fee charging private schools accounted for about 8.5% of Chilean students, fee-charging private voucher schools accounted for about 25.3% of students, free private voucher schools accounted for about 12.5% of students and public schools served approximately 52.1% of students (Anand *et al*, 2009: 372).

McEwan and Carnoy (2000) found that non-religious private voucher schools were no more effective at producing student achievement than public schools, after controlling for the socio-economic profile of the student body and other school characteristics. However, non-religious private schools were found to have a cost-effectiveness advantage over public schools of about 13-17%. McEwan and Carnoy (2000: 227) suggest that the combination of higher wages and less regulatory flexibility within the public schools sector may underlie this difference in cost-effectiveness. A study published by the Central Bank of Chile (Ramos, 2002) concluded that private schools could not be said to be uniformly more or less effective than public schools. The study did, however, find that public schools were more effective for low SES students (Ramos, 2002: 31).

A weakness of the studies by McEwan and Carnoy (2000) and Ramos (2002) is that the data used by them did not have student characteristics, but only school-level variables. This means that various important student characteristics cannot be included as explanatory variables, and that any bias in the way students select themselves into public and private schools cannot be controlled for either. More recently student-level data for Chile has become available, thus allowing analysts to reach less biased estimates of the private school effect. Anand *et al* (2009) compared the relative effectiveness of fee-charging private voucher schools, free private voucher schools and public schools applying corrective measures to control for sample selection and including SES and various other characteristics at the student level. A noteworthy innovation of this study is that it identifies students in fee-charging private

voucher schools who were awarded scholarships (not based on academic achievement) and would otherwise have attended free private or public schools, and then compares their performance with students of matching characteristics in the other school types. Anand *et al* (2009; 371) come to the conclusion that both free and fee-charging private schools are more effective at producing academic achievement for low SES students than public schools. The estimated effect is statistically significant, although fairly small. However, the authors warn that their methodology does not allow for certainty as to why students with the same characteristics do better in private schools. The effect could be due to better peers in private schools, more involved parent bodies, superior school management or more effective teachers, but the data cannot speak directly to any of these possible channels (Anand *et al*, 2009: 371).

Another extensive voucher programme has been implemented in Columbia. The "Programa de Ampliación de Cobertura de la Educación Secundaria" (PACES) has provided vouchers amounting to the equivalent of low to middle fee-charging private schools in Columbia. These vouchers could be used within fee-charging public schools or private schools and were renewable conditional upon passing each grade. The value of the voucher was received by the schools directly from government. An interesting feature of the Columbian case is that many vouchers were distributed by a lottery due to excess demand. This created a type of natural experiment suitable for an analysis of the benefits of receiving a voucher – the outcomes of lottery winners could be compared with those of lottery losers with otherwise similar characteristics. To the extent that the vouchers increase the probability of enrolling in a private school the analysis has implications for the relative effectiveness of private and public schools in Columbia. In this way, Angrist *et al* (2002) examined the benefits to lottery winners three years after the vouchers were awarded. Lottery winners were found to be approximately 10% more likely to have completed the 8th grade than lottery losers, mainly because of reduced grade repetition. Moreover, lottery winners achieved higher test scores and were found to be less likely to cohabit as teenagers or to be employed – conditions considered unfavourable to educational outcomes. Furthermore, Angrist *et al* (2002: 1556) estimated that these benefits enjoyed by lottery winners were greater than the economic cost of the vouchers. The authors attribute the benefits of the PACES vouchers to three possible channels. Firstly, it was found that lottery winners were more likely to attend private schools than were lottery losers, and private schools may be more effective than public schools. This is suggestive of a positive private school effect on the educational outcomes observed. Secondly, voucher recipients who would have attended private schools anyway, may have attended more expensive schools, which were also better schools. Thirdly, the fact that vouchers could be lost through failure to progress to the next grade may have incentivised students to work harder, leading to the observed benefits (Angrist *et al*, 2002: 1556).

An earlier and influential study by Cox and Jimenez (1991) examined the private school effect in Columbia prior to the introduction of the PACES vouchers, as well as in Tanzania. They presented evidence of a private school achievement advantage in both Colombia and Tanzania after controlling for

student and school characteristics. However, this study has come under some critique – for omitted variable bias regarding school characteristics (Glewwe, 2002: 461) and for not adjusting for peer effects or clustering (Somers, McEwan, and Willms, 2004: 55).

Somers, McEwan, and Willms (2004) have demonstrated how adjusting for peer effects can substantively alter the estimated relative effectiveness of private schools. Their analysis covered ten Latin American countries and estimated the private school effect using three different statistical models, and applying them to each country.[1] In the first model the educational outcome of interest (language achievement or mathematics achievement) is predicted by only school type and grade. This model specification yielded estimates of a private school achievement advantage hovering around half a standard deviation. The second model specification included controls for student SES and school location. This specification obtained slightly smaller estimates of the private school effect, indicating that a small proportion of the achievement advantage enjoyed by private schools was attributable to the higher SES of students in those schools. The third model included peer group characteristics and returned estimates of the private school effect that hovered around zero. The authors therefore conclude that a large proportion of the superior performance of private schools is accounted for by peer effects (Somers, McEwan, and Willms, 2004: 69). This is perhaps an irrelevant point from the perspective of parents deciding on whether to enrol their children in private or public schools. However, it holds important implications from a policy perspective – if the private school effect emanates from peer group characteristics rather than more effective management and governance, then increasing the size of the private school sector may not necessarily improve outcomes substantially because "the stock of good peers is finite", as Somers, McEwan and Willms (2004) argue.

Geeta Kingdon (1996) carried out a very thorough analysis of the private school effect in the case of Indian students in their final year of primary school. Her study was dealt with favourably by Paul Glewwe (2002) in his extensive and scrutinising review of the literature on schooling in developing countries. Kingdon's study focussed on three categories of schools in India – government schools, privately managed schools that are almost entirely funded by government (private aided schools) and private unaided schools. Kingdon (1996: 61) suggests two *a priori* reasons to expect private schooling in India to be of a higher quality than publicly funded schools. The higher level of performance on examinations by private schools is a first indicator of quality. Secondly, the observable growth in the demand for fee-charging private unaided schooling was probably reflective of the higher quality of education offered by that sector of the school system. Making appropriate adjustments to control for sample selection bias into the three school types, Kingdon (1996) found that unaided private schools had a performance advantage over aided private and government schools, after controlling for student characteristics. Kingdon also collected data on the cost per pupil in each of the schools in the study.

[1] Somers, McEwan and Willms (2004) used multilevel modelling, which is a technique that is appropriate when data contains two levels of observation and one is nested in the other, e.g. when students (with associated characteristics) are nested in schools (with associated characteristics).

Using this information, she established that unaided private schools also were more cost-effective than the other school types, thus reinforcing their achievement advantage. She therefore advocates the expansion of the private unaided school sector, arguing that this would promote an efficiency gain as well as improvement in equity because the public funding for government schools would then be better targeted toward the poor (Kingdon, 1996: 78-79).

1.2) Evidence from Africa

The literature on independent schooling, and specifically on the relative effectiveness of private schools, in Africa is very thin. In 2005 the Centre for Development and Enterprise (CDE) released a report on private schooling for the poor, in which the results of several international research projects were summarised and integrated into a presentation drawing attention to the potential benefits of private education for the poor in the African and South African context (Bernstein, 2005). According to one of the studies in this report, which looked at private schooling amongst the poor in Ghana, Nigeria, Kenya, India and China (Tooley *et al*, quoted in Bernstein, 2005), private schools serving the poor in these countries were able to produce higher student achievement at lower cost. Although this report is a meta-analysis and therefore less directly informative than original empirical work, such as the studies reviewed above, it does at least offer some indication that private schooling may be a promising alternative in Africa.

In order to gain some further indication of the performance of independent schools in Africa, some brief analysis was done using data from the Southern African Consortium for Monitoring Educational Quality (SACMEQ) project. The second round of the SACMEQ project administered reading and mathematics tests to grade 6 students in 14 Southern and East African countries, and collected survey data regarding the schools, teachers and home backgrounds of these students. The data thus lends itself to multivariate regression analysis, a statistical technique which can be used to estimate the effects of particular characteristics on an outcome of interest, such as the effect of being enrolled in an independent school on educational achievement. However, the SACMEQ data is not ideally suited for the analysis of the relative effectiveness of independent schools due to the small number of independent schools that were surveyed. Table 1 shows the number of public and independent schools that were surveyed in the SACMEQ II project, for each country.

It is evident that in some countries only a handful of independent schools were included in the sample. Therefore, countries in which fewer than five independent schools were surveyed were excluded from the multivariate analysis.

Table 1: Numbers of Public and independent schools in the SACMEQ sample

	Public	Independent	Total
Botswana	164	6	170
Kenya	176	8	184
Lesotho	70	107	177
Malawi	137	3	140
Mauritius	118	35	153
Mozambique	162	6	168
Namibia	258	12	270
Seychelles	23	1	24
South Africa	164	3	167
Swaziland	160	8	168
Tanzania	181	0	181
Uganda	154	9	163
Zambia	164	5	169
Zanzibar	142	3	145
Total	2 073	206	2 279

Another consideration to bear in mind when analysing the performance of independent schools in SACMEQ is the likelihood that the nature and exact definition of the independent schools sector differs significantly across the various SACMEQ countries. Despite this consideration and the small numbers of independent schools in the sample, it was felt that a multivariate regression analysis might yield a useful initial indication of the effectiveness of independent schools in Southern Africa. The results of this analysis are reported in Tables 2 and 3. Table 2 presents separate Ordinary Least Squares (OLS) regression models predicting reading achievement for each country. Table 3 presents the equivalent for mathematics achievement.

The explanatory variables included a male dummy variable, a dummy for whether the student spoke the language of the test at home sometimes or often as opposed to never and a dummy for school location (rural vs non-rural).[2] An index for student SES was constructed by applying Principal Components Analysis to a set of variables capturing whether certain household goods are present in the student's home.[3]

[2] A dummy variable takes a value of either 1 or zero. For example, the "male" dummy takes a value of 1 if the student was a male and zero if the student was a female.

[3] There were 14 "possessions" variables in SACMEQ II that were included in the SES index. These were a daily newspaper, weekly/monthly magazine, radio, TV set, Video Cassette Recorder (VCR), cassette player, telephone, refrigerator/freezer, car, motorcycle, bicycle, piped water, electricity and a table to write on. Principal Components Analysis is a statistical technique commonly used to construct asset-based indices of household wealth. The use of the method is advocated by *inter alia,* Filmer and Pritchett (2001). For a detailed explanation of the methodology see Taylor and Yu (2009).

Table 2: Multivariate regressions predicting reading achievement

	Botswana	Kenya	Lesotho	Mauritius	Mozambique	Namibia	Swaziland	Uganda	Zambia
Male	-30.31***	-1.65	-8.47***	-26.51***	8.55***	-6.70***	-9.05***	3.84	5.09
Speaks language	34.23***	25.50***	17.86***	68.65***	43.01***	16.67***	11.21***	37.07***	41.50***
Rural	-15.01***	-18.25***	-17.15***	-7.50	-11.13***	-21.27***	-6.75**	-21.37***	-19.05***
SES	13.17***	15.31***	1.24	40.99***	3.72*	5.42***	7.90***	19.22***	4.66
SES squared	6.99***	-4.82**				3.85***			
School mean SES	0.84	45.73***	32.00***	-53.83***	14.47***	16.32***	-3.51	2.52	24.28***
School SES squared	13.08***		29.10***	25.95***		24.67***	23.84***	-11.40***	14.21***
Independent	**71.76*** **	**-1.26**	**-9.78*** **	**11.86** **	**9.34**	**12.29***	**9.21***	**57.22*** **	**30.89*** **
Constant	504.91***	569.93	461.84***	454.72	482.67***	420.90***	518.47***	483.66***	413.11***
R-squared	0.26	0.21	0.14	0.16	0.08	0.48	0.19	0.11	0.21
Observations	3322	3282	3155	2945	3038	5048	3139	2642	2538
Independent (Reg A)	**163.63*** **	**92.03*** **	**-5.43** **	**11.41***	**12.42** **	**137.67*** **	**18.52*** **	**72.44*** **	**71.98*** **

Table 3: Multivariate regressions predicting mathematics achievement

	Botswana	Kenya	Lesotho	Mauritius	Mozambique	Namibia	Swaziland	Uganda	Zambia
Male	-10.13***	22.69***	-3.12	-7.28	21.95***	3.02	4.80**	15.78***	10.21***
Speaks language	27.19***	15.98***	17.87***	75.54***	33.87***	11.20***	7.94***	20.13***	34.05***
Rural	-7.59**	-13.14***	-25.24***	-12.10**	-6.12**	-15.14***	8.24**	-18.67***	-9.04**
SES	11.12***	13.80***	-1.50	20.13**	-1.88	3.90**	6.49***	20.37***	3.00
SES squared		-5.40*		9.77**		4.56***		-6.32*	
School mean SES	-0.41	30.71***	11.59***	-52.79***	7.99***	12.73***	-0.11	-9.82***	13.56***
School SES squared	9.08***	6.03**	18.99***	26.43***	-4.99**	22.33***	17.37***	-9.99***	8.64***
Independent	**77.70*** **	**10.14**	**-3.13**	**1.80**	**-0.72**	**19.74*** **	**5.80**	**44.65*** **	**22.13** **
Constant	492.83***	567.61***	450.43***	486.24***	489.73***	400.83***	492.70***	510.61***	403.72***
R-squared	0.16	0.14	0.09	0.16	0.06	0.40	0.09	0.05	0.12
Observations	3321	3279	3144	2870	2999	3990	3138	2619	2517
Independent (Reg A)	**130.52*** **	**84.96*** **	**-3.97**	**1.31**	**1.02**	**128.22*** **	**14.99** **	**52.95*** **	**45.31*** **

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level

For the sake of interpretation, the SES variable has been standardised to have a mean of zero and a standard deviation of one. The square of SES was included in the models if its estimated effect was statistically significant, indicating that the relationship between SES and reading or mathematics scores was indeed non-linear. The mean SES for each school was also included in the models, as educational research has shown that the SES of school peers can have an even greater effect on educational outcomes than a student's own socio-economic background (e.g. Coleman *et al*, 1966; Taylor and Yu, 2009). Again, the square of school mean SES was included if there was evidence of non-linearity. Lastly, a dummy variable for independent schools was included in order to estimate the so-called "private school effect".

The models in Tables 2 and 3 predict reading and mathematics achievement using the variables outlined above, for each country. In general the models predicting reading achievement had greater explanatory power than those predicting mathematics achievement, as indicated by the R-squared values. The models had rather weak explanatory power for some countries, such as Mozambique, while in other countries, such as Namibia, a relatively large proportion of the overall variance in achievement was explained by the models. The effect of gender varied across the models with girls usually doing better in reading and boys usually doing better in mathematics. Speaking the language of the test was consistently associated with higher achievement, while students in rural schools typically performed worse than those in non-rural schools. As might be expected, SES and especially school mean SES had a strong effect on achievement in most countries.

The coefficients on the independent school dummy can be interpreted as the effect of being in an independent school on a student's score, after controlling for all the other variables in the model. In the case of the reading models (Table 1), the coefficients on the independent dummy were positive and statistically significant in six out of the nine countries. In Mauritius, Namibia and Swaziland this effect was fairly small, whereas independent schools had a large performance advantage in Botswana, Uganda and Zambia. The largest effect was for Botswana where being in an independent school was associated with a reading score advantage of 71.76 points, which is almost 0.72 standard deviations on the SACMEQ scale. In Kenya and Mozambique the independent school effect was not significantly different from zero. A small negative and statistically significant effect was obtained for Lesotho, although the large size of the independent schools sector in this country may be an indication that the public/independent distinction in Lesotho is not directly comparable with that in the other countries. In Table 2 for mathematics achievement, the coefficient on the independent dummy was positive and statistically significant in four countries. In the remaining five countries the effect was not significantly different from zero.

The bottom row in each of Tables 2 and 3 is the coefficient on the independent schools dummy in a reduced version of the model, which for convenience has been labelled Regression [A]. This version of the models predicts reading and mathematics by the independent dummy together with gender and whether the student spoke the language of the test at home. Therefore, school location and SES are not controlled for in Regression [A]. As independent schools are typically more affluent than public schools, the coefficients on the independent dummy are generally inflated in Regression [A], as some of the effects of SES and location are contained in the independent dummy. This is indicative of the risks inherent in comparing independent and public schools. The apparent quality premium offered by independent schools is generally only in part attributable to a better schooling process. A large part of this premium is a result of the home background advantages of independent school pupils.

Therefore, in summary of Tables 2 and 3, it appears that there is preliminary evidence of a performance advantage for independent schools in some of the SACMEQ countries. It should be noted that the evidence is not comprehensive across all the countries and is weaker in the case of mathematics achievement. Some of this apparent advantage is due to school location and the SES of students. However, even after taking account of these factors there remains some evidence of a positive private school effect in some of the SACMEQ countries.

Section 2: Analysing the performance of the independent schools sector in South Africa

2.1) Previous research and the profile of the independent schools sector

Traditionally, there has been a perception that independent schools in South Africa are "white, affluent and exclusive," as Hofmeyr and Lee (2004: 143) have described. Early accounts of the independent schools sector certainly contributed to this perception, and perhaps rightly so. Randall (1982) characterised South African independent schools as a "little England in the veld". Similarly, Christie (1990) argued that although private schools in South Africa were open to black students, the dominant ethic at these schools aimed at getting black students to assimilate the dominant white (and specifically capitalist) values.

More recently, using data for the entire independent schools sector collected in 2001 by the Human Sciences Research Council, Du Toit (2004) provided a broad quantitative overview of the sector. This

overview confirmed that there has been dramatic growth and change in the profile of the sector. Many new independent schools were registered during the 1990's, with the growth of the sector peaking in 1999 and slowing somewhat thereafter (Du Toit, 2004: 36). Moreover, there have been considerable changes in the socio-economic and racial profile of independent schools. As Hofmeyr and Lee (2004: 143) observe, "The majority of learners at independent schools are now black, while the majority of schools are new (established since 1990), charge average to low fees and are religious or community-based." Tables 4 and 5 are based on Du Toit's (2004) sectoral overview and confirm that by 2002 the majority of independent schools charged average to low fees and that the majority of students in independent schools were black. Du Toit (2004: 35) also found that independent schools enjoyed a higher average pass rate in the matric examination than public schools – 68.9% versus 61.7%.

Table 4: Socio-economic profile of Independent School Sector in 2002

School Fee Category	%
R0-6000	52.9
R6001-12000	21.6
R12001-18000	11.7
R18001+	13.8

Source: Du Toit (2004)

Table 5: Racial profile of Independent School Sector in 2002

Race group	%
Black	58.3
Coloured	4.8
Indian	7.5
White	29.4

Source: Du Toit (2004)

The Community Survey of 2007 (CS 2007) collected a wide range of information about South Africans at the individual and household level, including a question about whether those enrolled in an educational institution were in a public or independent institution. This allows for a more recent estimation of the characteristics of those in independent schools and of the socio-economic and racial profile of the independent schools sector. Table 6 depicts the proportions of each race group that are enrolled in public and independent institutions. The table indicates that white and Indian students are considerably more likely to attend independent schools than coloured and black students. Note that the sample has been restricted to include only those of a school-going age in order to exclude forms of adult education.

Table 6: Proportions of students in each sector by race group in 2007 (%)

	Public schools	Independent Schools	Total
Black	97.22	2.78	100
Coloured	96.02	3.98	100
Indian/Asian	85.32	14.68	100
White	78.58	21.42	100
Total	95.95	4.05	100

Source: Community Survey 2007

Figures 1 and 2 display the racial composition of public and independent schools respectively, according to the Community Survey data. Black students make up the majority in both the public and independent school sectors. It is interesting that the estimate obtained from the Community Survey that 58.66% of learners in independent schools were black is remarkably close to Du Toit's (2004) estimate of 58.3%, as reported in Table 5.

Figure 1: Racial composition of Public schools (CS 2007)

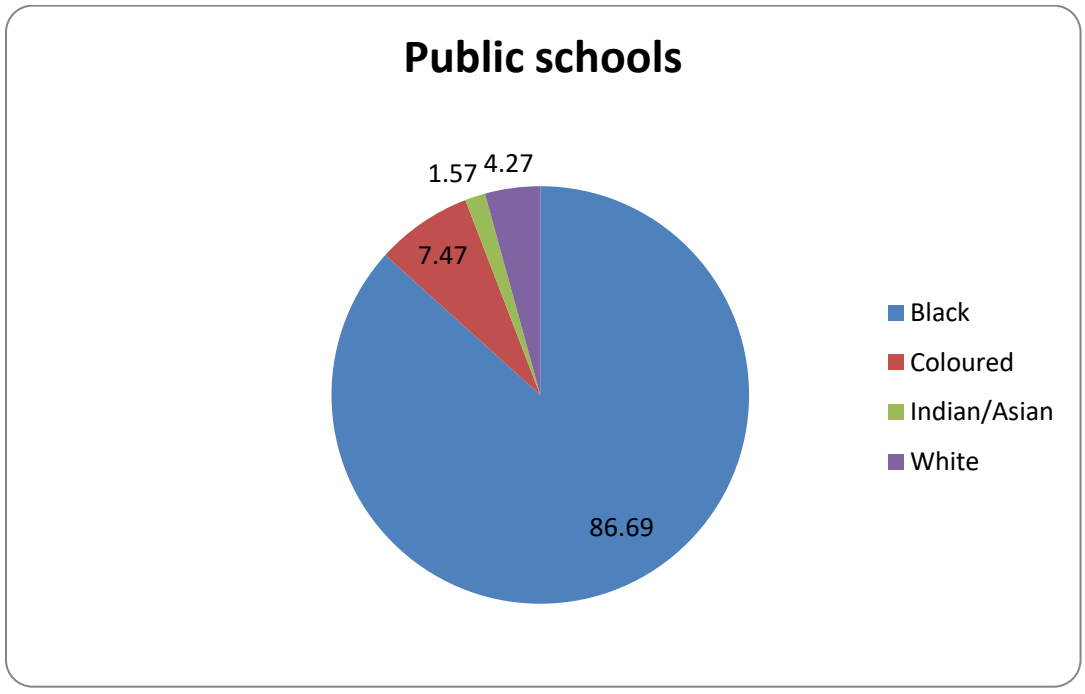
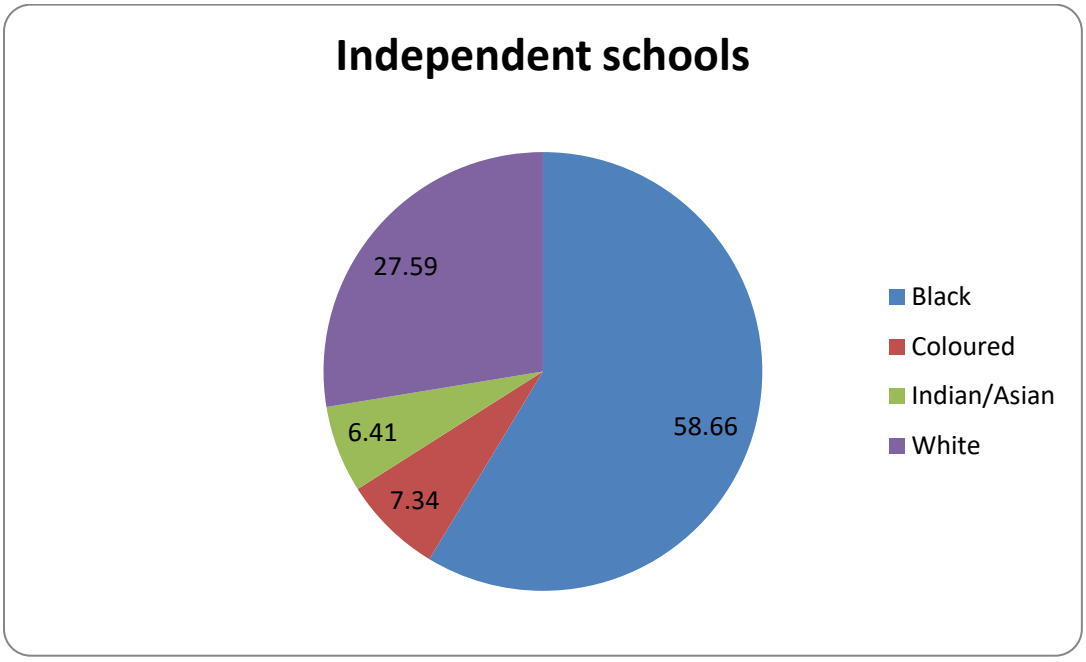


Figure 2: Racial composition of Independent schools (CS 2007)



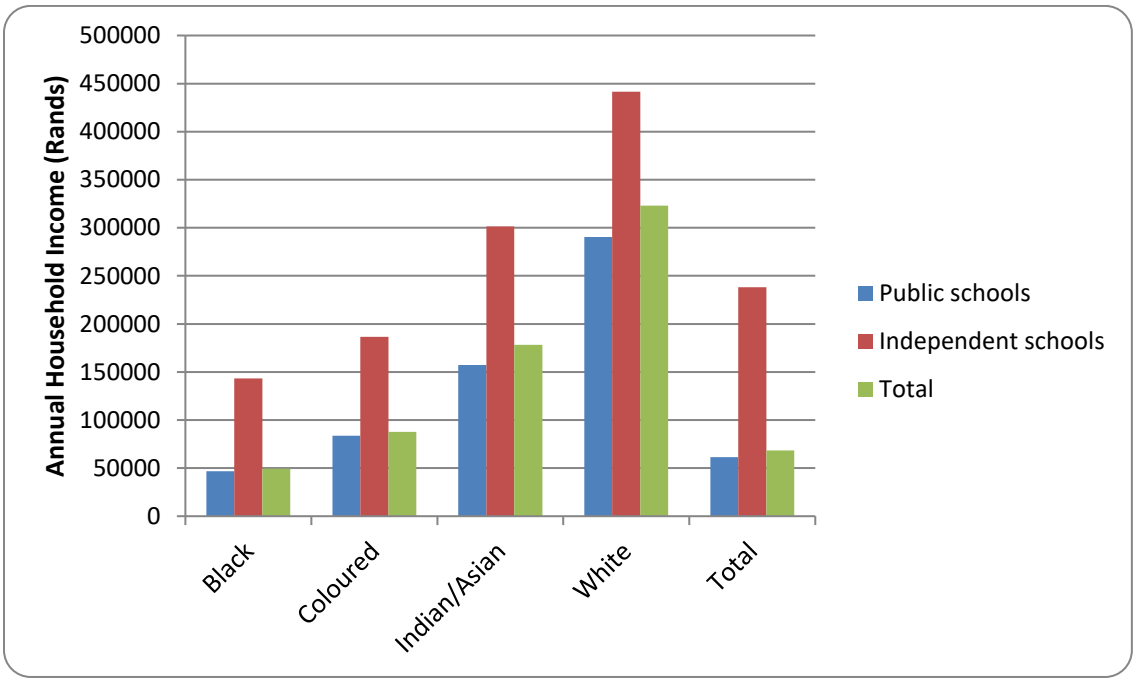
Although black learners constitute a majority in independent schools, they represent a much bigger proportion of the public school sector. The Community Survey also reveals that the two sectors have very different socio-economic profiles. Table 7 reports the average annual household income by race and school sector, while Figure 3 shows the same information more visually in the form of a bar chart.[4] Unsurprisingly given South Africa's history and well-known persistent inequality, there are clear patterns by race with annual household income being highest amongst whites and then Indians, coloureds and blacks in that order. Moreover, it can be seen that within each race group the average annual household income is higher amongst those enrolled in independent schools than those in public schools. This indicates that independent schools have a more affluent sample of students to work with than do public schools.

[4] The Community Survey suffers from widespread non-response and reported household incomes of zero. In order to deal with this, the "annual household income" variable was not used. Rather, the maximum annual *personal* income within each household was used as proxy for the income of the household. Of course this may underestimate total household income but it is perhaps a better proxy for socio-economic status, especially given the data limitations of the annual household income variable. As a result, the measure of household income used in Table 6 and Figure 3 has minimal non-response and a smaller proportion of reported incomes of zero. As a separate experiment testing whether this remaining non-response and reported incomes of zero affected the overall patterns evident in Table 7 and Figure 3, a value for household income was imputed for these cases. The value for imputation was obtained by predicting household income by race group and an asset-based index for socio-economic status. The derivation of this index is explained in the main text below. Using the new measure for household income including the imputed values in cases of non-response and reported incomes of zero raised the estimated averages across all categories by a small amount but did not change the overall patterns evident in Table 7 and Figure 3.

Table 7: Average annual household income (in Rands) by school sector and race group (CS 2007)

	Black	Coloured	Indian/Asian	White	Total
Public schools	46633	83700	157332	290579	61382
Independent schools	143319	186537	301443	441382	238232
Total	49307	87773	178179	322933	68491

Figure 3: Average annual household income by school sector and race group (CS 2007)

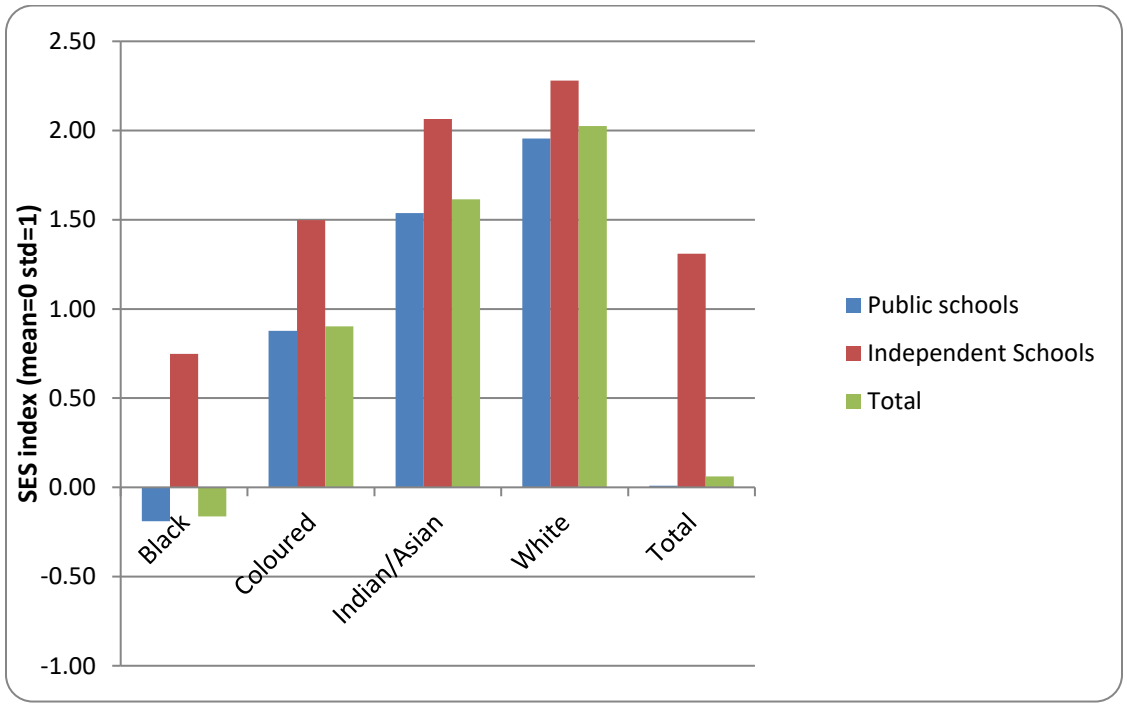


An alternative to the use of annual household income as a measure of SES is to derive an asset-based index of household wealth. The latter is a longer-term indicator of wealth than annual income, a characteristic that might be considered advantageous when the purpose is to investigate the association of educational outcomes with SES. An index for household socio-economic status was generated by applying Principal Components Analysis (PCA) to a number of variables in the Community Survey. These were household income and variables capturing whether the household had access to piped water, a toilet, a refrigerator, a radio, a computer, a television, a telephone, the internet and a cell phone. The resulting SES index was standardised to have a mean of zero and standard deviation of one. Table 8 and the associated bar chart in Figure 4 show the average household SES by school sector and race group. The same overall pattern that emerged when the outcome of interest was annual household income is now evident using the asset-based index for SES. There is a strong racial dimension to the distribution of SES, and within each race group average SES is higher amongst those attending independent schools than those in public schools.

Table 8: Average household SES by school sector and race group (CS 2007)

	Black	Coloured	Indian/Asian	White	Total
Public schools	-0.19	0.88	1.54	1.95	0.01
Independent schools	0.75	1.50	2.07	2.28	1.31
Total	-0.16	0.90	1.61	2.02	0.06

Figure 4: Average household SES by school sector and race group (CS 2007)



Research shows that SES has a strong influence on educational outcomes. This relationship holds throughout the world, but is especially powerful in South Africa (Taylor and Yu, 2009). Therefore, the fact that for each race group those in independent schools are more affluent on average than those in public schools, gives the independent schools sector an initial advantage in the quest for educational achievement. The importance of accounting for these differences will be demonstrated in the next section, which analyses the performance of the two sectors as measured by matric pass rates.

2.2) Analysis of matric pass rates

2.2.1) The data

Two sources of data were merged using national EMIS numbers in order to construct an appropriate dataset for the bulk of the empirical analysis presented in this section. The number of students writing and passing matric in each school was obtained from the Senior Certificate database for 2006, which is housed at the Department of Education (DoE). Various other school characteristics such as information regarding the numbers of learners and educators in schools, pre-1994 education department and the level of expenditure and fees charged were obtained from the Annual Survey of Schools (ASS) for 2005. The ASS collects data using a school booklet (76 pages in 2005) and a one-page educator form (each educator completes one form). Provincial education departments administer the survey in all public and independent ordinary schools and capture the data. The DoE consolidates the data into a national database.

Tables 9 and 10 present descriptive statistics of the relevant variables for public and independent schools, respectively. Several qualifications regarding the variables should be noted before analysing the descriptive statistics. Only schools that offer matric are included as the matric pass rate will be the indicator of performance. The learner-teacher ratio was calculated by dividing the number of learners by the number of educators at each school. The variable "funds" is the annual expenditure per learner undertaken by the school itself and was calculated by dividing the total school expenditure for 2005 by the number of learners. A further step in the derivation of the "funds" variable was to add R5 500 to the expenditure per learner for each public school as this is approximately what the state spends on in kind inputs, notably educators. It is not appropriate to do the same for independent schools as they do not receive in kind contributions but only receive funding from the state, which would be included in the original expenditure. The weighted means of "funds" and "fees" were calculated by attaching a weight to schools according to the number of students that wrote matric. This adjustment ensures that small and large schools do not carry the same weight in their influence on the means for the entire sector. Lastly, in Tables 9 and 10 the summary statistics for "fees" exclude cases where school fees were less than R25. The data is from 2005, before the commencement of the "no-fee" schools policy, which raises doubts about the reliability of such low reported fees.[5]

[5] Moreover, some eyeballing of cases where zero or extremely low fees were reported confirmed that these data entries should not be relied on.

Table 9: Descriptive statistics for Public schools

Variable	Observations	Mean	Std. Dev.	Min	Max
From ASS 2005:					
Number of learners	5734	681.42	397.01	4	2634
Grade 10 learners	5651	176.52	119.6	4	893
Grade 11 learners	5650	140.8	89.55	3	719
Number of educators	5731	22.26	12.91	1	157
Learner-teacher ratio	5711	31.6	22.36	3.72	1201
Funds (unweighted)	5719	5169.74	1335.54	601.85	18500
Funds (weighted)	5410	5135.82	1283.58	601.85	18500
Fees (unweighted)	5016	577.42	1471.91	25	20000
Fees (weighted)	5015	776.52	1802.56	25	20000
From matric database:					
Total wrote matric	5843	88	60.49	0	1173
Total passed matric	5843	57.19	46.86	0	391

Table 10: Descriptive statistics for Independent schools

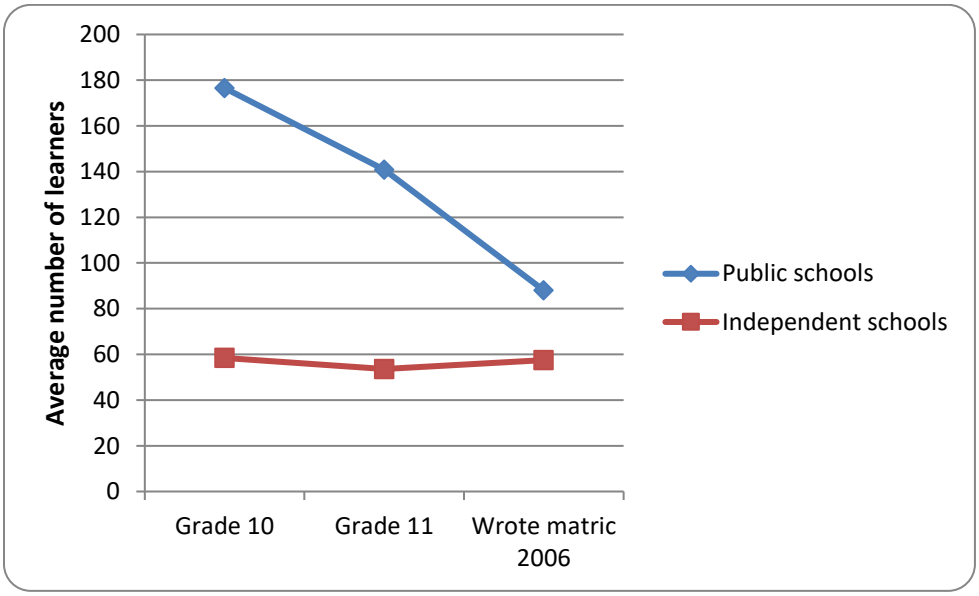
Variable	Observations	Mean	Std. Dev.	Min	Max
From ASS 2005:					
Number of learners	306	398.91	318.07	3	2659
Grade 10 learners	294	58.44	58.35	1	476
Grade 11 learners	295	53.61	46.42	2	335
Number of educators	308	22.48	14.29	1	113
Learner-teacher ratio	300	18.09	11.27	2.86	115.86
Funds (unweighted)	288	7812.25	3870.86	798.68	19259.26
Funds (weighted)	258	7127.86	3834.68	798.68	18352.94
Fees (unweighted)	217	4505.27	3459.91	25	20000
Fees (weighted)	217	4007.84	3024.43	25	20000
From matric database:					
Total wrote matric	351	57.55	72.61	1	567
Total passed matric	351	40.88	49.78	0	466

Comparing Tables 9 and 10 yields several interesting differences between public and independent schools. For a start there are far more public schools than independent schools in the dataset, as South Africa's independent schools sector is small in comparison to the public schools sector. There are 5843 public schools and 351 independent schools in the dataset. The smaller sample size for independent schools means that for much of the analysis to follow in this section, statistical estimations relating to

this sector are usually made with less precision than is the case for public schools.[6] Independent schools are considerably smaller on average than public schools as indicated by the total number of learners in each school and confirmed by the average number of grade 10 learners, grade 11 learners and matric learners. Despite being having fewer students on average, independent schools have a very similar number of educators per school to that of public schools. Consequently, the learner-teacher ratio is smaller on average amongst independent schools. However, the learner-teacher ratio did not prove to be a significant predictor of matric pass rates in the multivariate regression analysis to follow in this report. Therefore no further analysis of this variable is presented here.

Another interesting trend emerging from Tables 9 and 10 is that in public schools the average number of learners in grade 10 is noticeably higher than the average number of grade 11 learners, which in turn is considerably higher than the average number that wrote matric in each school. In contrast, the average numbers in each grade are fairly stable for independent schools. Figure 5 shows this trend graphically.

Figure 5: Average number of learners by grade and school sector



[6] Strictly speaking it is incorrect to speak of a "sample" as the dataset is in fact the *population* of secondary schools in South Africa. Thus one might choose to ignore measures of statistical confidence such as standard errors of means, which express the degree of certainty that estimations obtained from a sample do in fact accurately represent the population from which the sample was drawn. However, there is a sense in which a social reality outcome, such as the distribution of matric pass rates, is a sample of a data generating process that could have yielded any number of outcomes. Therefore, it was decided to include such statistics at times in this report to indicate the probability that similar estimates or results would be obtained if matric testing was repeatedly administered yielding different school pass rates each time. Put differently, these measures of statistical confidence indicate the level of certainty about a fundamental trend or mechanism underlying the data.

Figure 5 may be indicative that the phenomenon of "weeding" is prevalent in public schools. Weeding refers to the practice of systematic non-promotion of weaker students into matric in order for schools to achieve a more impressive pass rate in the matric examination. The stability of the numbers from grade 10 to matric for independent schools is perhaps an indication of higher education quality prior to matric, demonstrated by a greater ability to convert reaching grade 10 into reaching matric. The difference between public and independent schools in this respect is dramatic, and therefore may deserve further investigation by policy-makers.

A last difference between public and independent schools that should be noted from Tables 9 and 10 is that the level of funding per learner and the level of school fees is higher on average for independent schools. This trend held for both the weighted and unweighted calculations of the means. Another distinction that is pursued in this report is that of the former education department those schools were part of or would have been if they had existed in the previous regime.[7] This distinction may strike one as contentious or no longer relevant. However, a strong case exists for making this distinction in empirical analyses of educational outcomes in South Africa given the current performance of the various parts of the system. The distribution of educational achievement in South Africa can be described as bimodal – there is a well performing part of the system consisting of mainly historically white and Indian schools and a less well functioning part of the system consisting of mainly historically black and coloured schools (Van der Berg, 2008; Fleisch, 2008). Table 11 presents a cross-tabulation of the schools in the dataset by former education department and sector.

Table 11: Summary of schools in the dataset by sector and former education department

Former department	Public schools	Independent schools	Total
DET (B)	4,802	261	5,063
	82%	74%	82%
HOR (C)	285	7	292
	5%	2%	5%
HOD (I)	152	4	156
	3%	1%	3%
HOA (W)	604	79	683
	10%	23%	11%
Total	5,843	351	6,194
	100%	100%	100%

[7] Under apartheid schools were governed by separate education departments on the basis of race. HOA schools catered for white students, HOD schools catered for Indian students, HOR schools catered for coloured students and DET schools catered for black students. The various homelands also had education departments, but for the present purposes these are grouped together with the former DET schools.

2.2.2) Preliminary analysis of matric pass rates and "conversion rates"

The simplest way to calculate matric pass rates for each school is to divide the total number of learners that passed matric in 2006 by the total number that wrote matric, and then multiply by 100 to convert this into a percentage. Using this calculation the average pass rate amongst public schools is 65.1% compared to 77.1% amongst independent schools. Table 12 reports this together with various other ways of expressing the performance of the two sectors at producing matric passes. When schools were weighted according to the number that wrote matric the difference in average pass rates between the two sectors is somewhat smaller – a gap of just over 7 percentage points. This narrowing of the gap when the weighting was applied reflects the fact that many of the top performing independent schools were small. The "adjusted pass rates" reported in Table 12 were constructed in an attempt to control for the practice of "weeding" discussed above. This adjustment involved changing the denominator to be the number of learners in grade 10 for schools where the number of grade 10 learners was greater than the number that wrote matric. Therefore, the adjusted pass rates are given by the following formulas:

For schools in which the number of grade 10 students was less than the number that wrote matric:

Adjusted pass rate = (total number that passed matric / total number that wrote matric)*100.

For schools in which the number of grade 10 students was less than the number that wrote matric:

Adjusted pass rate = (total number that passed matric / total number enrolled in grade 10)*100.

Table 12: Different versions of the average matric pass rate by sector

	Public schools	Independent schools	Total
Unweighted pass rate	65.1	77.1	65.7
Weighted pass rate	66.1	73.3	66.4
Unweighted adjusted pass rate	34.6	57.0	35.7
Weighted adjusted pass rate	38.1	59.4	38.7

The average "adjusted pass rates" were considerably lower than the original pass rates due to the greater numbers in grade 10 than in matric. This difference is especially large for public schools due to the low follow-through from grade 10 to matric, as Figure 5 demonstrated. It is therefore perhaps more accurate to think of the "adjusted pass rates" as the rate of conversion of grade 10 enrolments into

matric passes. The weighted adjusted pass rates are thus probably the best estimation of the success of the two sectors in producing matric passes. This seems to be confirmed by the models that are discussed below. According to this measure independent schools enjoy an advantage of approximately 21 percentage points.

The message from the above table is that independent schools perform considerably better on average than public schools, before controlling for factors such as the resource base of the schools or the SES of the student bodies. This is confirmed by Figure 6 and 7, which present percentile plots of the mean pass rates and adjusted pass rates, respectively, for each sector. By splitting the performance of each sector into percentiles, these plots offer a comparison between public and independent schools across the distribution of performance.

Figure 6: Percentile plots of mean pass rate by sector

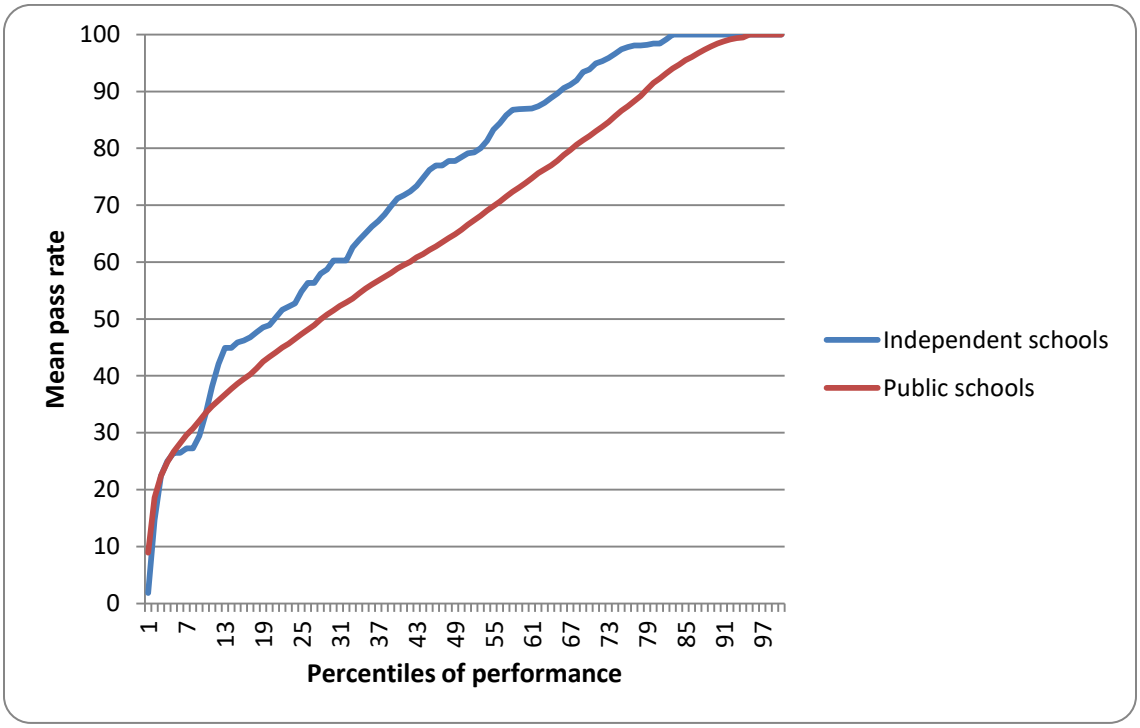
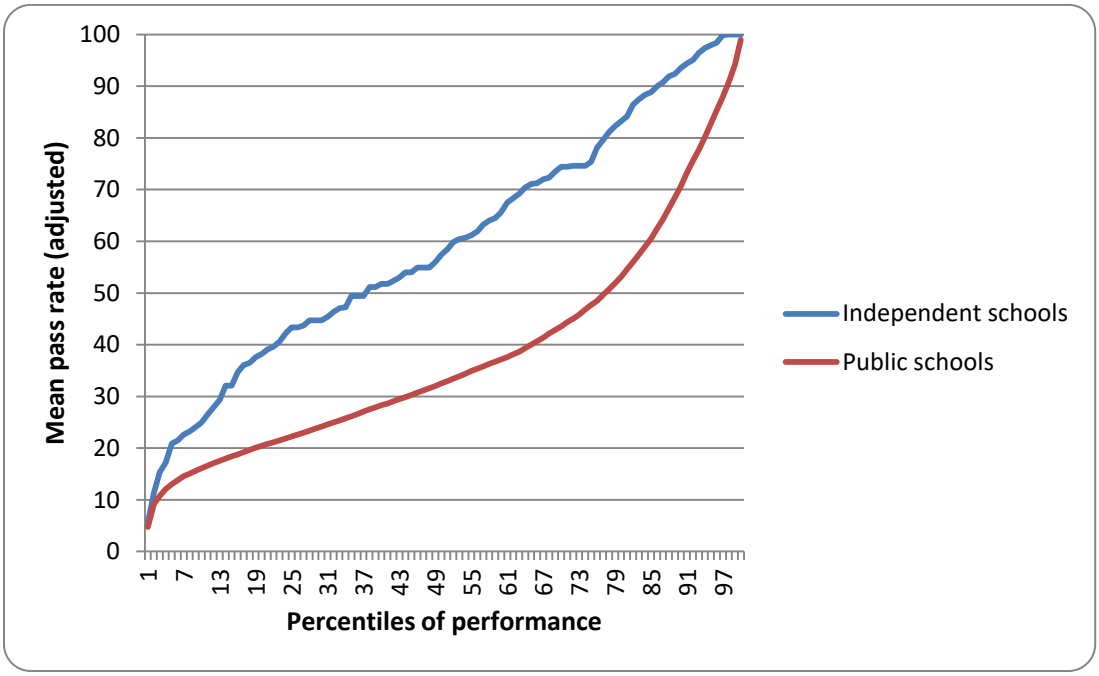


Figure 6 shows that at almost every point in each sector's distribution of performance, the average pass rate is higher for independent schools than for public schools at the corresponding percentile of performance. The difference in pass rates between public and independent schools across the distribution is more substantial when the pass rate is adjusted for so-called "weeding", as Figure 7

demonstrates. This would again suggest that weeding is more prevalent within public schools than independent schools.

Figure 7: Percentile plots of mean adjusted pass rate by sector



Another way of looking at the distribution of performance in the two sectors is by plotting kernel density curves, as done in Figure 8 below. One can think of kernel density curves as a smoothed version of a histogram. These curves connect kernel estimates of the density of an outcome at each point across its distribution. The peak of a kernel density curve is therefore the mode of the distribution. It is clear from Figure 8 that the distribution of the adjusted pass rates, or rate of conversion from grade 10 to matric passes, is denser at the bottom end for the public sector than the independent sector. Conversely, there is a greater concentration at the top end for independent schools than for public schools. Moreover, the mode of the adjusted pass rate is considerably higher for independent schools than public schools. Put differently, the bulk of the distribution of performance for independent schools lies to the right of that of public sector.

All the above analysis does not condition on any characteristics of schools or students. It is already evident from the summary statistics that there are considerable differences between public and independent schools with respect to the level of funding, the fees that are charged (which can be considered a proxy for the SES of the student body), etc. The policy-relevant question is whether the

independent schooling sector still performs better than the public sector once these other factors are controlled for. Table 13 below compares the performance of each sector and adds the distinction of the former education department of schools to the analysis.

Figure 8: Kernel density curves of mean adjusted pass rate by sector

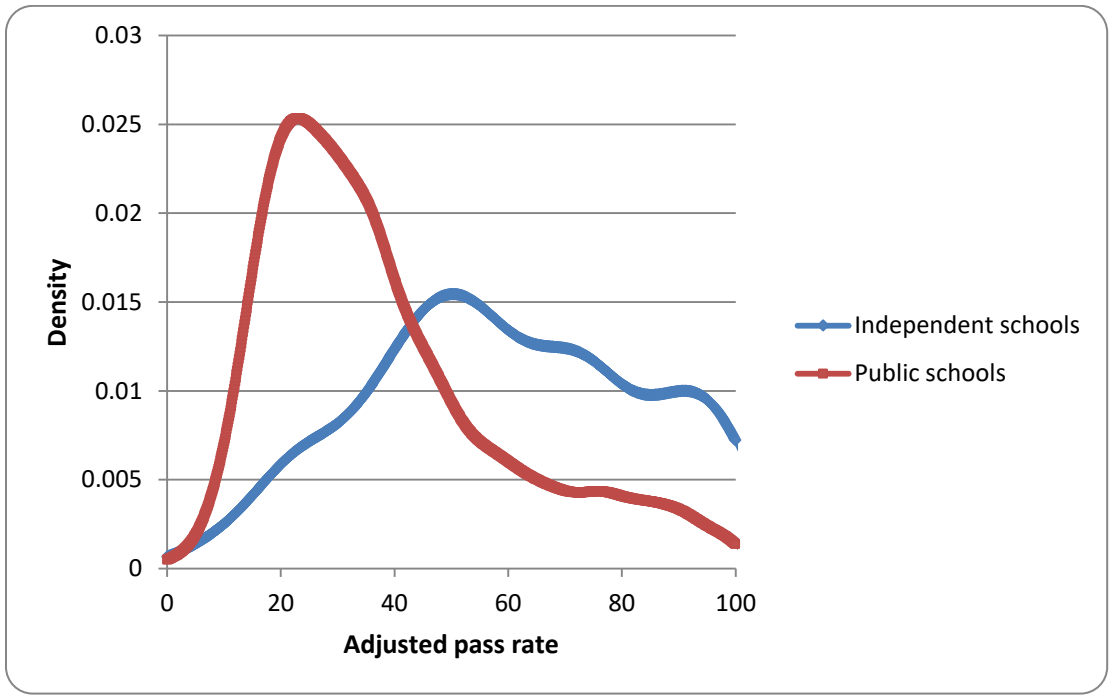


Table 13: Mean pass rate by sector and former department

Sector	Obs	Mean	Std. Err.	95% Confidence	Interval
DET, Public	4798	59.4%	0.31	58.82	60.02
DET, Independent	261	68.5%	1.57	65.39	71.58
HOR, Public	285	77.0%	0.90	75.25	78.80
HOR, Independent	7	91.6%	3.22	83.70	99.44
HOD, Public	152	87.6%	0.94	85.75	89.46
HOD, Independent	4	88.6%	10.59	54.87	122.29
HOA, Public	607	96.4%	0.33	95.76	97.06
HOA, Independent	79	91.7%	1.32	89.05	94.30

The mean pass rates and 95% confidence intervals reported above in Table 13 are presented graphically in Figure 9. As might be expected, the historically white (HOA) and Indian (HOD) schools had higher pass rates on average than historically coloured (HOR) and black (DET) schools. A noteworthy feature,

however, is that historically black independent schools achieved higher matric pass rates on average than historically black public schools. Similarly, independent schools had a performance advantage amongst historically coloured schools. In contrast, public schools achieved higher pass rates on average than independent schools amongst historically white schools. Small sample size for historically Indian independent schools, causing a wide confidence interval, detracts from the value of comparison within this category.

Figure 9: Mean pass rate and 95% confidence intervals by sector and former department

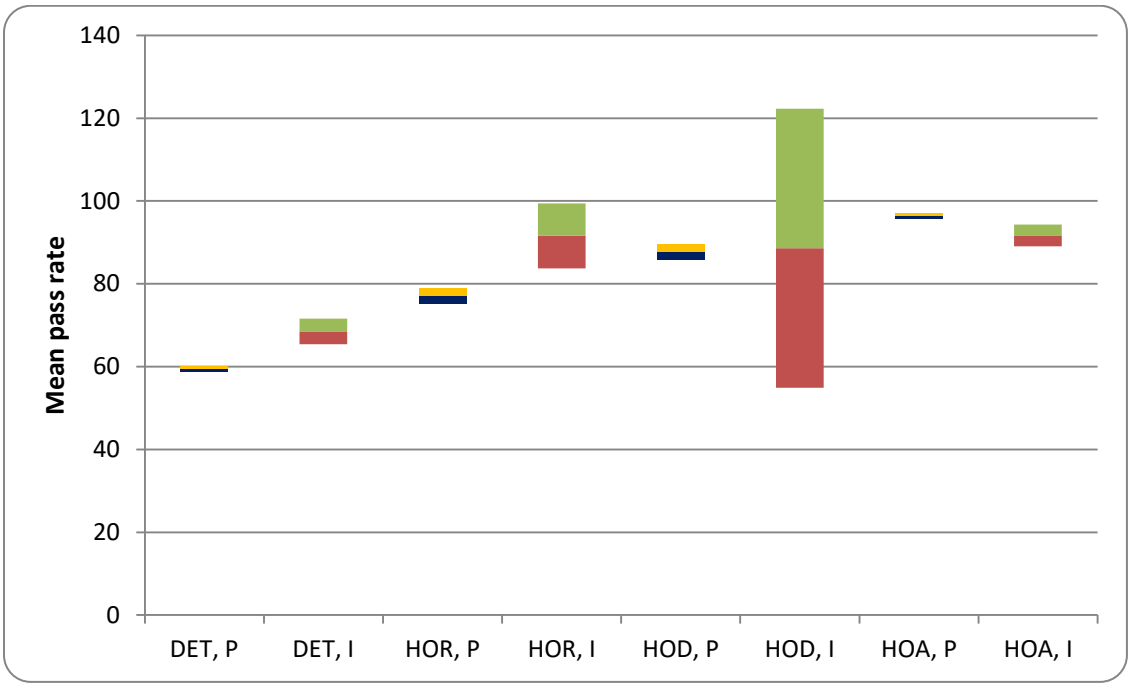
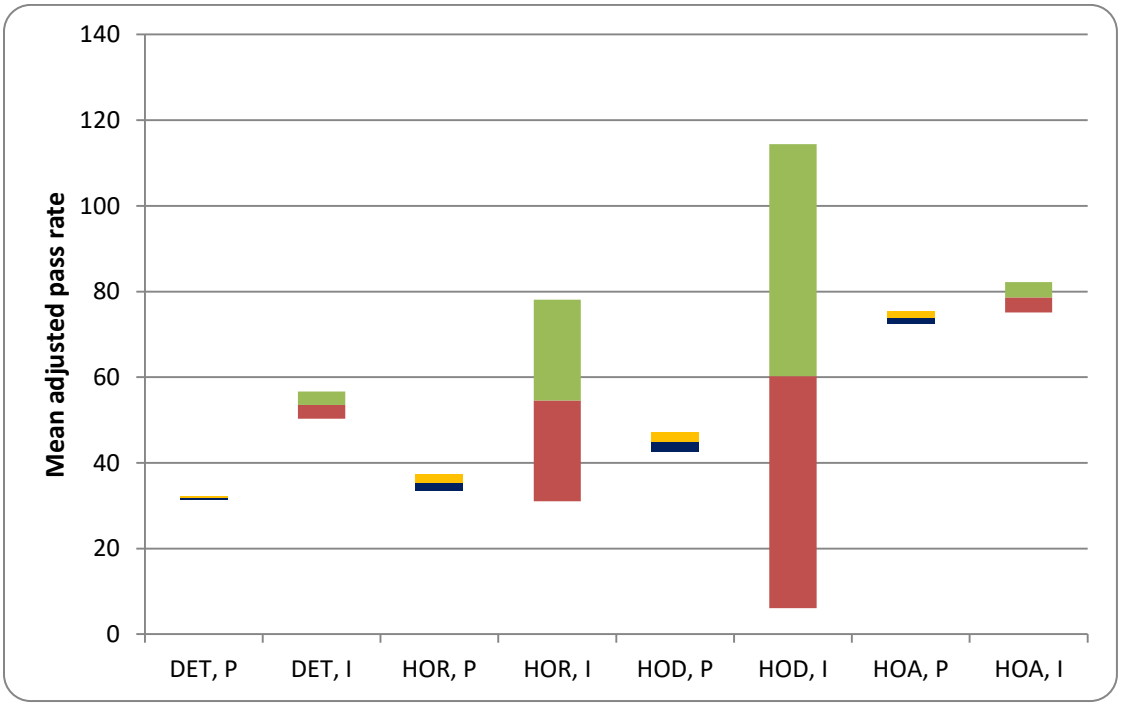


Table 14 and Figure 10 below present a similar picture, only this time the adjusted pass rates are compared across sector and former department. Now the performance advantage of the independent sector amongst historically black and coloured schools is even larger – in the region of 20 percentage points in both cases. This is an important finding from a policy perspective as historically black and coloured schools constitute the vast majority of the school system and serve the bulk of South Africa's low SES and historically disadvantaged learners. The need to improve educational outcomes amongst these schools for the sake of social transformation is clear. Therefore, the superior performance of independent historically black and coloured schools relative to their public sector counterparts is a potentially important finding.

Table 14: Mean adjusted pass rate by sector and former department

Sector	Obs	Mean	Std. Err.	95% Confidence	Interval
DET, Public	4617	31.9%	0.22	31.44	32.31
DET, Independent	208	53.5%	1.60	50.35	56.66
HOR, Public	281	35.4%	0.99	33.42	37.31
HOR, Independent	6	54.6%	9.15	31.04	78.07
HOD, Public	149	44.8%	1.15	42.58	47.11
HOD, Independent	3	60.2%	12.59	6.08	114.40
HOA, Public	603	74.0%	0.72	72.59	75.40
HOA, Independent	77	78.7%	1.77	75.12	82.18

Figure 10: Mean adjusted pass rate and 95% confidence intervals by sector and former department



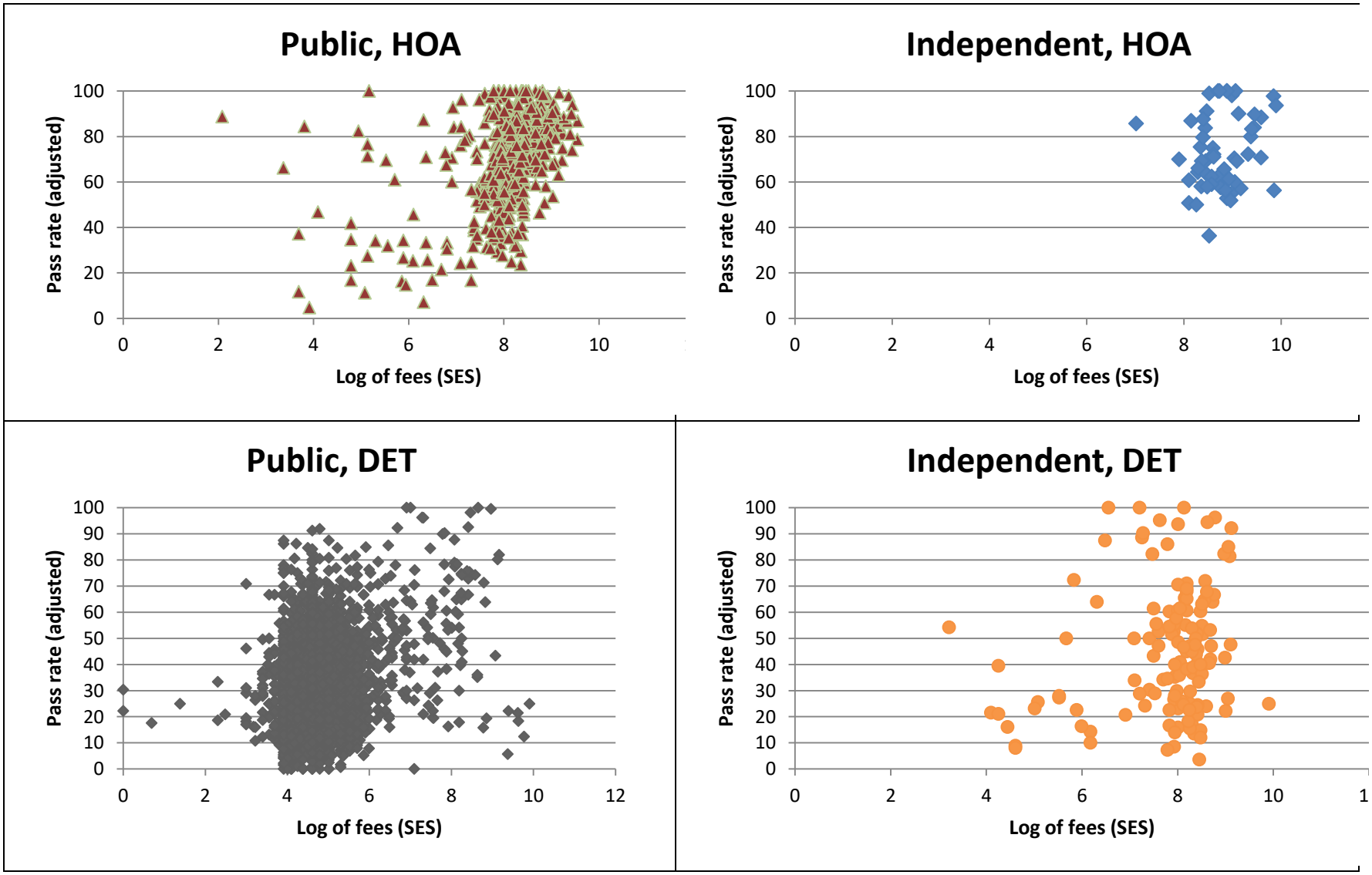
Although there is evidence of a performance advantage for the independent sector within the historically black and coloured part of the system, it is necessary to be sensitive to the differences in SES between these categories of schools in order to more realistically assess the relative effectiveness of independent schools. Figure 11 demonstrates that there are considerable differences in the socio-economic profiles of independent and public schools, within each historical division. The figure shows scatter plots of the adjusted pass rate against the log of school fees, for historically white (HOA) public and independent schools, and for historically black (DET) public and independent schools. Note that the school fee charged by each school is the best proxy for the SES of the student body amongst the

available data, and will therefore be treated as such for most of the forthcoming analysis. Due to the small number of historically coloured and Indian independent schools in the sample, the figure was restricted to historically black and white schools. The numbers of schools and mean log of fees for each of the categories in the graphs below are as follows.

Table 15: Mean school fees by school category

Category	Number of schools	mean log of fees
Public, HOA	453	8.22
Independent, HOA	56	8.74
Public, DET	4193	4.93
Independent, DET	134	7.58

Figure 11: Scatter plots of fees and pass rates by sector and former education department



It is evident that within both former departments, independent schools serve a more affluent student body than public schools. Thus it is unclear whether (or to what extent) the superior performance of independent schools is attributable to the fact that these schools serve more affluent children. This necessitates the use of multivariate regression analysis in order to estimate the effect of being in an independent school conditional upon all the other variables in the model. This form of analysis is pursued in the next section. To close this section, however, consider the performance of independent and public schools conditional only upon the level of funding per student in each school. Glewwe (2002) discusses the use of performance per dollar spent on education as a viable measure of the efficiency or cost-effectiveness of schools. This concept was appropriated to derive a measure of efficiency using the data at hand. The adjusted pass rate in each school was divided by the number of Rands of funding per learner and then multiplied by 100. The measure is thus the adjusted pass rate increment per R100 of funding per learner.

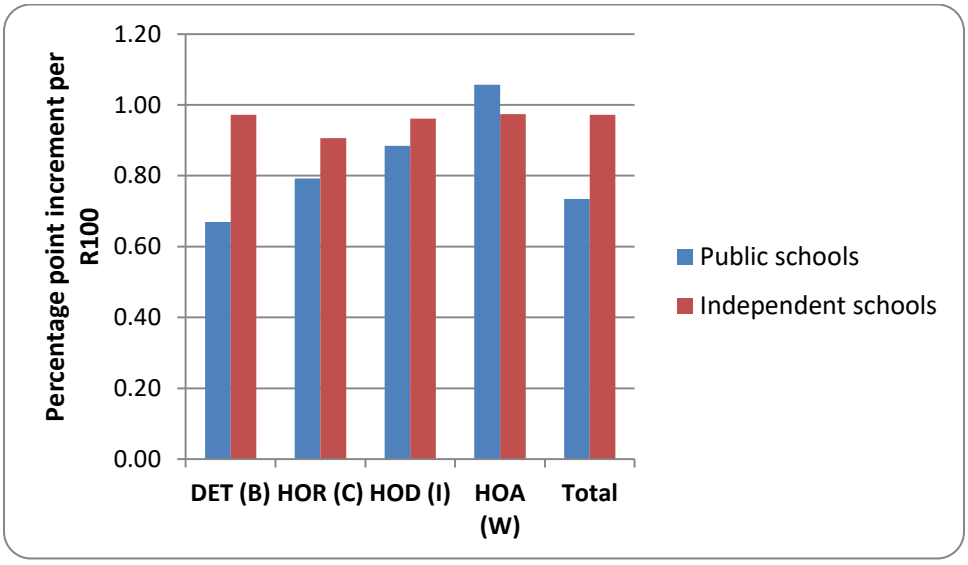
Table 16 demonstrates that independent schools achieve a higher level of efficiency, according to this measure. Every R100 per learner that is spent in independent schools can be thought to "buy" almost a one percentage point increment in the adjusted pass rate. In public schools the same R100 only "buys" 0.73 percentage points.

Table 16: Pass rate increment (percentage points) per R100 of funding per learner

	Average	Std.dev.	obs.
Public schools	0.73	0.34	5634
Independent schools	0.97	0.45	273
Total	0.74	0.34	5907

Figure 12 adds the distinction of former education department. The most noteworthy aspect of the figure is that R100 spent on historically black independent schools appears to "buy" considerably more performance than R100 that is spent within historically black public schools. This result, taken together with the preceding analysis, would suggest that independent schools enjoy an overall performance and efficiency advantage over public schools in South Africa, and that this is largely driven by differences within the historically black part of the system. The multivariate analysis to follow provides a more rigorous interrogation of this finding.

Figure 12: Average adjusted pass rate increment (percentage points) per R100 of funding per learner by former department



2.2.3) Multivariate regression analysis

A model for the educational performance of schools could be described by the following function:

Y = f (F, SES, S, D)

The educational performance (*Y*), as measured by the matric pass rate or the adjusted pass rate, is a function of the level of funding in each school (*F*), the home background or SES of the students at each school, the sector of the school (*S*) which is either independent or public, and the former education department (*D*). The funds per learner in each school can be used to represent *F*, while the school fee charged is the best proxy available for *SES*. The summary statistics for the variables used in the multivariate analysis were presented in Tables 8 and 9.

Table 17 reports the results of six Ordinary Least Squares regression models.[8] In models [A] and [B] the dependent variable is the matric pass rate in each school, while models [C], [D], [E] and [F] use the adjusted pass rate as the dependent variable. The level of funds per learner and the fees variable were entered in log form in order to approximate a more normal distribution for these variables.

[8] In all the models schools were weighted according to the total number of learners that wrote matric.

Table 17: Multivariate regression analysis predicting matric pass rate and the adjusted pass rate

	[A]	[B]	[C]	[D]	[E]	[F]
Dependent variable	**pass rate**[9]	**pass rate**	**adjusted pass rate**[10]	**adjusted pass rate**	**adjusted pass rate**	**adjusted pass rate**
Explanatory variables						
Log of funds per learner	32.91 (27.22)**	2.74 (1.78)	0.22 (18.16)**	23.31(18.89)**	16.53 (13.19)**	17.38 (13.80)**
Independent school	3.53 (2.14)*	-16.68 (9.41)**	-0.03 (1.93)	50.95(7.03)**	2.60 (1.79)	39.84 (5.61)**
Log of fees		9.89 (38.45)**	0.08 (38.69)**	8.05(39.38)**	4.99 (17.79)**	5.24 (18.18)**
Log of fees_x_independent				-6.99(7.56)**		-4.88 (5.36)**
HOA (W)					18.08 (16.48)**	17.18 (15.52)**
HOD (I)					3.89 (3.15)**	3.50 (2.84)**
HOR (C)					-2.50 (1.99)*	-2.74 (2.19)*
Constant	-213.92 (20.78)**	-11.75 (0.95)	-1.97 (19.91)**	-204.86(20.73)**	-132.69	-141.12 (13.57)**
R-squared	0.1152	0.3281	0.4752	0.4810	0.5048	0.5076
Observations	6006	5170	5089	5089	5089	5089

*Significant at the 5% level **Significant at the 1% level

Absolute values of t-statistics in parentheses

[9] Pass rate = (total number that passed matric / total number that wrote matric)*100

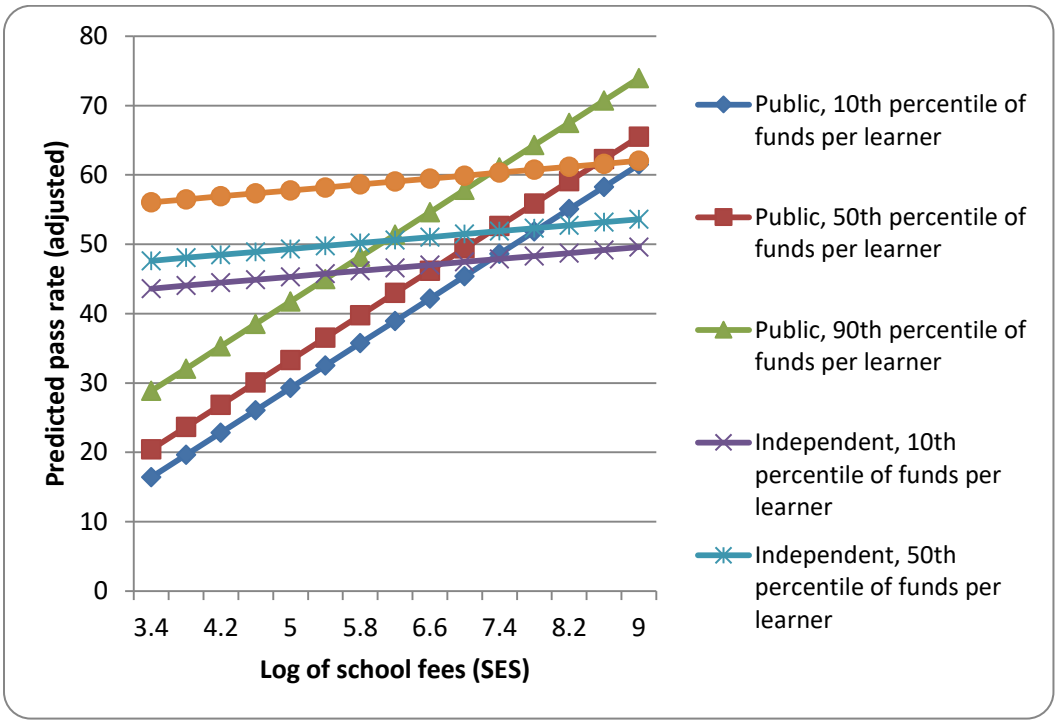
[10] If the number of matriculants was greater than the number of grade 10 students then: Adjusted pass rate = (total number that passed matric / total number that wrote matric)*100. If the number of matriculants was less than the number of grade 10 students then: Adjusted pass rate = (total number that passed matric / total number that were enrolled in grade 10)*100.

In model [A] the matric pass rate was predicted by the funds per learner and the independent school dummy. The R-squared statistic indicates that these two variables alone accounted for about 11,5% of the variation in matric pass rates between schools. A large, positive and statistically significant effect of funds per learner was obtained. A fairly small yet statistically significant positive effect (3,53 percentage points) of being an independent school was obtained. Model [B] describes the independent school effect conditional upon funding per learner together with school fees. The explanatory power of this model is considerably greater than that of model [A]. An estimated 32,8% of the variation in matric pass rates was explained by model [B]. This improvement in the model fit was due largely to the inclusion of fees, as the coefficient on the log of funds per learner was no longer statistically significant. The log of school fees had a large, positive and statistically significant effect on school performance. This is indicative of the powerful influence of SES on educational outcomes in South Africa. Interestingly, the coefficient on the independent school dummy is negative and significant in model [B]. This would suggest that for a given level of school fees (SES) and funding, the expected matric pass rate is actually lower for independent schools than for public schools.

The dependent variable in models [C], [D], [E] and [F] was the adjusted pass rate, which essentially penalises schools for "weeding" and is therefore a better indicator of performance than the simple matric pass rate, as argued earlier. Model [C] included the same set of explanatory variables as model [B] but produced a substantially better model fit due to the use of the adjusted pass rate as the dependent variable. This provides further support for the contention that this is the more appropriate indicator of performance than the simple matric pass rate. The coefficients on the log of funds and the log of fees were both significant and positive, while the effect of the independent school dummy was not significantly different from zero. This might imply that the apparent performance advantage of public schools that was obtained in model [B] was attributable to "weeding".

In model [D] the log of school fees was allowed to interact with the type of school (independent or public). This means that the model is sensitive to the possibility that school fees (SES) may influence performance differently within the independent sector than it does within the public sector. All the coefficients in model [D] were significantly different from zero. In order to ease the interpretation of the estimated effects in model [D], they are presented graphically in Figure 13. The figure shows the relationship between SES (proxied by the log of fees) and school performance (measured by the adjusted pass rate) for each school sector at different levels of funding per learner. The less steep slopes for the independent schools indicate that the level of fees charged has a less pronounced effect on performance in this sector than it does amongst public sector schools. Moreover, the figure demonstrates that it cannot be said unequivocally that either sector has a higher expected performance once school fees are held constant. Rather it can be said that amongst medium to low SES schools the independent sector appears to perform better than the public sector. This obviously has important policy implications.

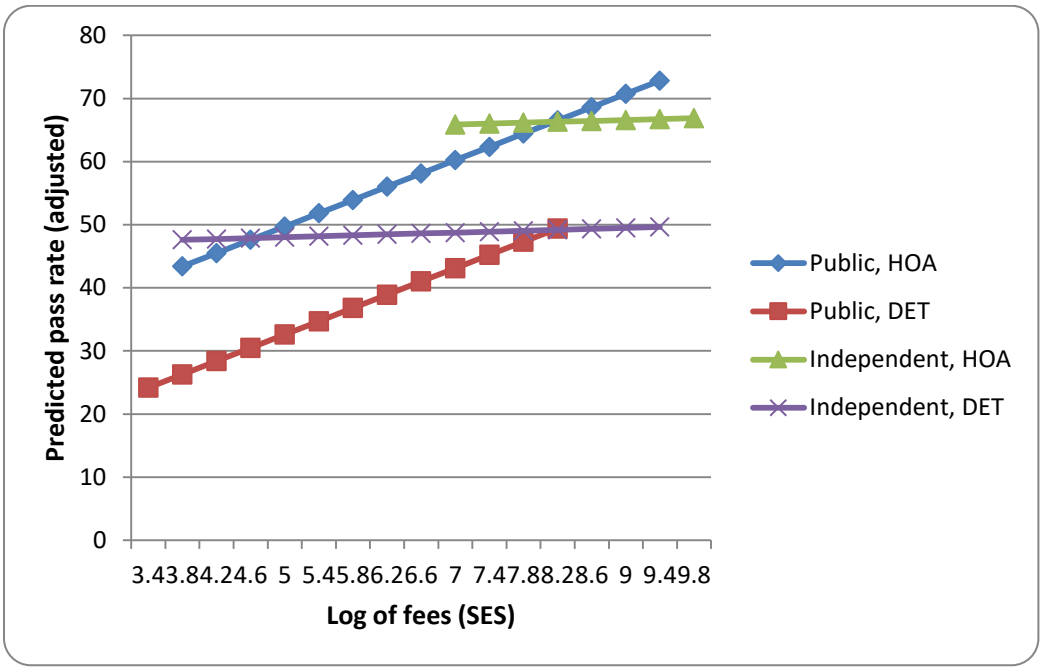
Figure 13: Graphical representation of Regression [D]



Model [E] does not allow for the interaction between school type and fees, but does introduce dummy variables for the former education departments, with ex-DET schools as the reference dummy. The results indicate that historically white and Indian schools performed better than historically black schools while historically coloured schools performed marginally worse than historically black schools, after controlling for funds, fees and school type. Model [F] does include the interaction between school type and fees, and can be considered to be the complete model. The explanatory power of this model is fairly pleasing, as the R-squared statistic indicates – over 50% of the total variation on adjusted pass rates is accounted for by the model. As before, a graphical presentation of the results offers a more accessible interpretation.

For the presentation in Figure 14, the range of school fees excluded the lowest and highest percentiles within each category in order to give an impression of the socio-economic profiles of these groups of schools. The estimates for historically Indian and coloured schools were not plotted in the figure so as to retain an uncluttered picture and due to small sample size. The figure indicates that historically white (HOA) independent schools serve a fairly high SES group of learners, but do not appear to perform substantially differently to historically white public schools of a comparable SES. Of greater interest is the result that historically black independent schools performed better than historically black public schools throughout most of the socio-economic distribution. Amongst the lower fee-charging schools the difference in predicted pass rate (adjusted) approached 20 percentage points. Also, the effect of the level of fees charged is less pronounced within the independent sector than within the public sector.

Figure 14: Graphical representation of Regression [F]



Notes: At the median level of funds per learner
(range=2nd to the 99th percentile of SES)

Table 18 displays two more regression models using an alternative version of SES. This version is an asset-based index of SES derived from the Community Survey, as explained in section 2.1. The Community Survey distributions of SES for those enrolled in public schools and independent schools were then divided into percentiles. Similarly, in the original dataset schools were divided into percentiles according to the level of fees charged. Again, this was done separately for public and independent schools. The Community Survey SES values were then imputed into the original dataset by matching percentiles, separately for each school sector.

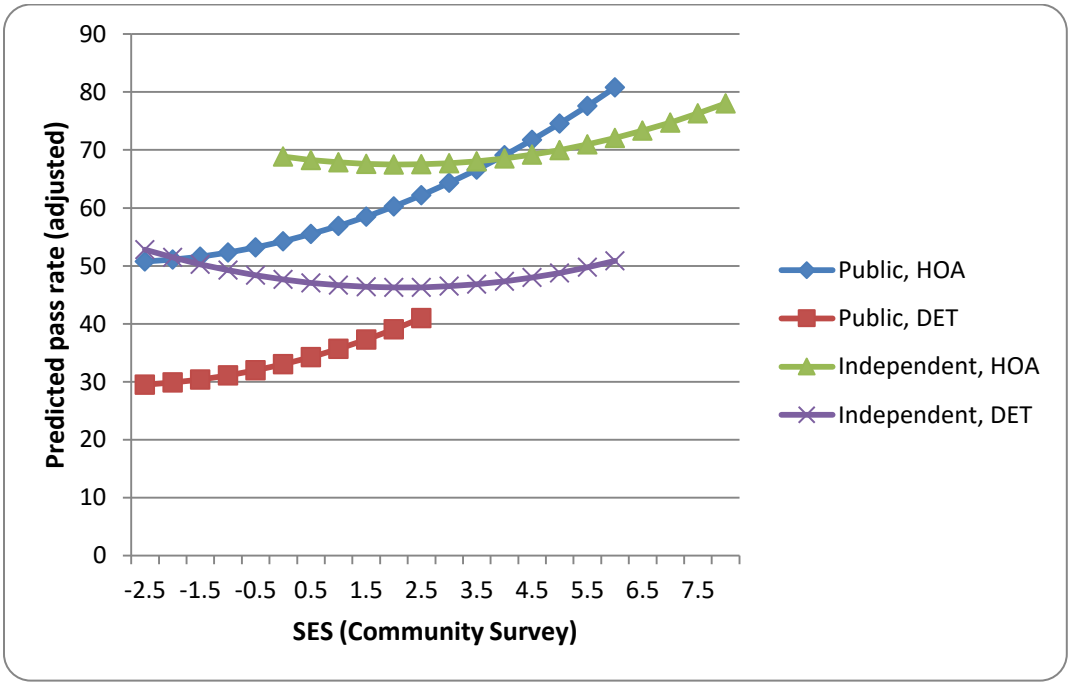
In models [G] and [H] presented in Table 18, this asset-based SES index was included instead of the log of school fees. The results therefore show what the effect of household SES on school performance would be if school fees was an accurate sorter of SES. Model [G] has the same specification as model [F] above, except with SES in the place of school fees. A very similar overall model fit and combination of estimated effects was obtained. In model [H] the square of SES and the interaction between school type and the square of SES were also included to allow for a non-linear effect of SES on performance. The positive statistically significant coefficient on SES_squared is evidence of non-linearity – at higher levels of SES the effect is larger. To ease interpretation of model [H] the estimates have been plotted graphically in Figure 15.

Table 18: Multivariate regression analysis using SES derived from Community Survey (2007)

	[G]	[H]
Dependent variable	**adjusted pass rate**	**adjusted pass rate**
Explanatory variables		
Log of funds per learner	19.20 (15.24)**	16.68 (12.79)**
Independent school	14.21 (7.47)**	14.61 (7.70)**
HOA (W)	23.64 (24.85)**	21.30 (21.28)**
HOD (I)	5.66 (4.61)**	5.66 (4.63)**
HOR (C)	-1.61 (1.28)	-1.64 (1.31)
SES	4.54 (15.31)**	4.34 (14.64)**
SES_x_independent	-5.21 (4.92)**	-6.82 (3.40)**
SES_squared		1.28 (7.07)**
SES_squared_x_ind.		-0.18 (0.25)
Constant	-129.05 (12.05)**	-108.63 (9.83)**
R-squared	0.4979	0.503
Observations	5089	5089

*Significant at the 5% level **Significant at the 1% level
Absolute values of t-statistics in parentheses

Figure 15: Graphical representation of Regression [H]

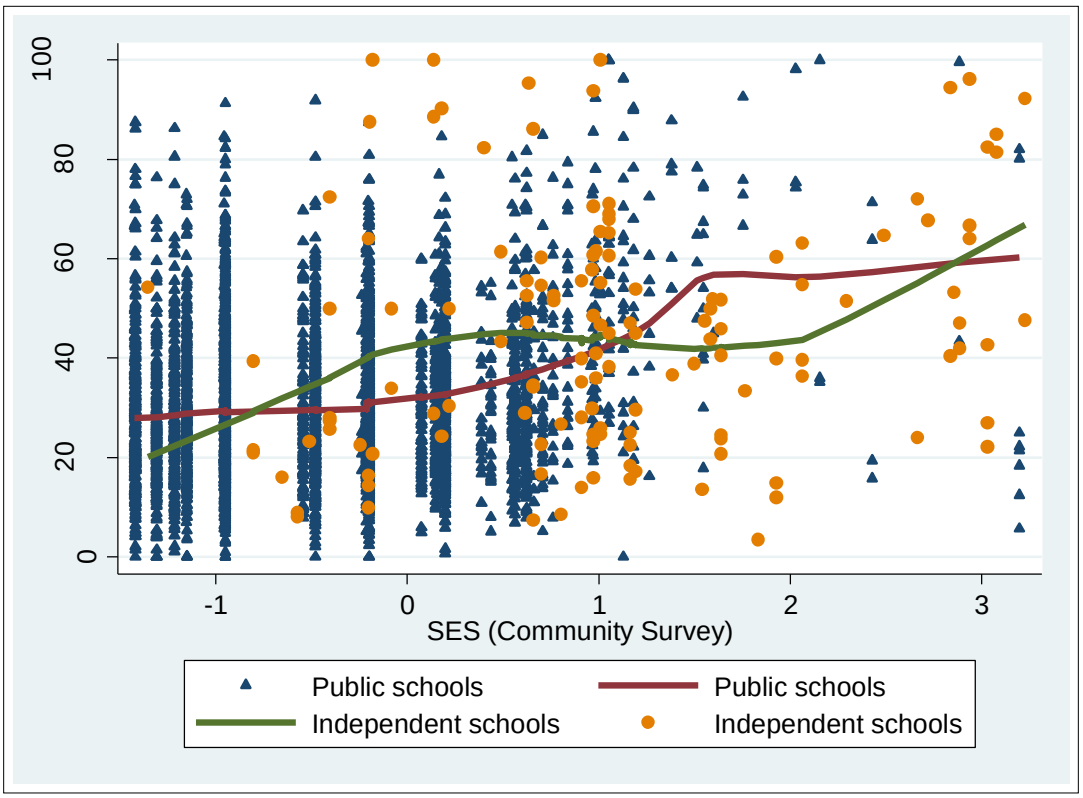


Notes: At the median level of funds per learner
(range=2nd to the 99th percentile of SES)

Figure 15 confirms the finding that amongst historically black schools, the independent sector had a higher rate of conversion into matric passes than the public sector, after SES and the level of funding per learner were controlled for. This is a potentially important finding given that historically black schools constitute the bulk of the less well functioning part of the school system and are therefore highest on the policy agenda. It is possible that an expansion of the independent sector that targets black learners could lead to an improvement in educational performance. However, this policy action cannot be advocated without reservation due to uncertainty about the channels through which historically black independent schools achieve this advantage. It could be due to a particular school characteristic or teaching method that is prevalent amongst these schools that could be appropriated into public schools. Or it could be that a selection bias is at work – students who are particularly motivated and students with parents who value education may be inclined to choose independent schools over public schools. This same motivational quality would then also contribute to higher educational achievement. It is impossible to investigate this selection bias with the data available. A fairly rich set of student level characteristics would be necessary to be sensitive to this issue. Nevertheless, the evidence presented here is sufficient to warrant further investigation into the relative effectiveness of the independent sector amongst the historically black and poorer part of the school system, and to alert policy makers to the possibility that an expansion of the independent sector within this part of the school system may contribute to improved educational achievement.

Figure 16 presents one more way of looking at the performance of independent schools conditional upon SES. The figure makes use of a technique called Lowess regression. This is a non-parametric form of regression, not requiring a linear or quadratic specification, which carries out locally weighted regressions at each data point and smooths the result. Therefore, the shape of the regression lines is not imposed by the researcher but is dependent on the data. Figure 16 shows Lowess regression lines of the relationship between the adjusted pass rate and SES (Community Survey) for independent schools and for public schools. The data is restricted to historically black (DET) schools in order to probe the apparent advantage of independent schools within this part of the system. Scatter plots are included to give a fuller picture of the distributions of these groups of schools. This demonstrates that the bulk of the public schools are located within the middle to low range of the socio-economic distribution (mean SES is zero). In contrast the independent schools are more evenly spread across the range of SES. Although public schools appear to have a performance advantage at the higher end of the socio-economic distribution, this is not as significant as the advantage that independent schools appear to have at the middle to low end of the distribution, because this is where the majority of the schools are located. Therefore, it can be said that the evidence from the Lowess regressions is supportive of the important result that emerged from the multivariate regression analysis, namely that amongst middle to low SES historically black schools the independent sector is performing more effectively than the public schools sector.

Figure 16: Lowess regressions and scatter plots for public and independent ex-DET schools



Conclusion

There are various theoretical reasons to expect private schooling to be more effective and more efficient than public schools. However, the international literature on the relative effectiveness of private schooling demonstrates that the empirical evidence of this is not altogether one-sided. It is probably fair to say that most studies find moderate positive effects of private schooling on educational achievement. The relative effectiveness of private schooling in the African and South African context remains a comparatively under-researched issue, largely due to a lack of suitable data. The analysis done in this report is therefore quite exploratory in nature.

This report found that independent schools performed better *on average* than public schools, as measured by the success rate of schools in achieving matric passes. Once SES and the level of funding per learner were accounted for, the independent school advantage was no longer unambiguous, but only remained within certain parts of the school system. A potentially important finding was that amongst the historically black part of the school system, independent schools performed better than their public sector counterparts at similar levels of SES and funding per learner. This finding should probably be regarded as preliminary and therefore deserving of further research. A more rigorous analysis would be made possible by the availability of data containing student characteristics. This would help ascertain whether the apparent advantage of independent schools within the historically black part of the system is attributable to differences amongst students and their backgrounds rather than superior educational processes.

Another uncertainty that cannot be addressed in this analysis and that has important implications for policy, relates to the underlying reasons for the apparent independent schools advantage. It is possible, for example, that highly motivated black students and those with parents who place a high value on education are likely to select themselves into the independent sector, and are also likely to perform well in school for the same reasons of motivation and home support. If this is the case then an expansion of the independent schools sector would not necessarily lead to improved overall performance as there is a limited stock of highly motivated students and parents. However, if the performance advantage of historically black independent schools is indeed due to superior management, better educational practice or other features peculiar to independent schools then an expansion of the independent schools sector might be a viable policy option.

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