SUCCEEDING AGAINST THE ODDS:

A QUANTITATIVE ASSESSMENT OF THE EFFECTIVENESS OF IKAMVAYOUTH

A report to IkamvaYouth

21 FEBRUARY 2016

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Executive Summary

The work presented here is essentially an update to the previous evaluation conducted by ReSEP (Research on Socio-Economics Policy), located in Stellenbosch University's Department of Economics: *Against the Odds: An Evaluation of the IkamvaYouth Programme*. This update to *Against the Odds* provides a more rigorous quantitative assessment of the contribution of the IkamvaYouth programme to learners' performance at school.

IkamvaYouth's contribution to the performance of its learners – the 'Ikamvanites' – is estimated in five matric subjects: English as a First Additional Language, Mathematics, Mathematical Literacy, Physical Sciences and Life Sciences. Estimates discussed in Section 1 of this report were conducted for the 2014 sample of matriculating learners who resided in provinces with matriculating Ikamvanites. These estimates suggest that the IkamvaYouth programme is associated with dramatic improvements ranging from a low as high as 0.293 standard deviations (about six percentage points) for Physical Sciences up to a high of 0.502 standard deviations (about ten percentage points) for Life Sciences. The magnitude of these coefficients can be appreciated when it is considered that a 0.30 standard deviations change in scores is considered approximately equivalent to a year of learning (Spaull & Kotzé, 2015:20).

Section 2 of this report checks the robustness of these results with a subsample of Western Cape learners who could be matched with their 2011 grade 9 Systemic Test results. Matching makes it possible to control for learners' pre-programme performance and thus for factors such as students' pre-programme motivation and ability. However, the matching process also restricts the sample to a subset of high-performing learners (learners who reached matric without failing a grade between grade 9 and matric) that, it is argued, are not a good counterfactual for how Ikamvanites would have performed had they not participated in the programme. As a result, estimates of the effectiveness of the programme obtained from the matched sample (Section 2) would under-represent the effectiveness of the programme. These estimates should thus be treated as lower-bound estimates of the effectiveness of IkamvaYouth.

Interpreted as suggested, these findings discussed in Section 2 of this report are very positive. These lower-bound estimates of the impact of the programme range from a high of 0.30 standard deviations (about 5.5 percentage points) for Life Sciences, still approximately a year of learning, to a low of 0.036 (about one percentage point) for Physical Sciences. The true impact of the programme probably lies well in excess of these estimates, and is probably closer to the estimates presented in Section 1 of this report. Thus, in sum, the findings suggest that IkamvaYouth does indeed add substantially to the performance of its learners, helping them to succeed against the odds.

Introduction

The work presented here is essentially an update to the previous evaluation conducted by Stellenbosch University's Department of Economics: *Against the Odds: An Evaluation of the IkamvaYouth Programme*. *Against the Odds* was very comprehensive in terms of the breadth of its assessment, but it was lacking in terms of its quantitative assessment of the impact of the programme on learners' performance at school. More specifically, the estimates of participating learners' performance included in the prior report could not account for learners' academic performance prior to joining the programme. Thus, while the estimates presented in *Against the Odds* indicated that participating learners certainly do excel academically, the report could not ascertain the extent to which these academic achievements reflected learners' pre-programme motivation or abilities rather than the effectiveness of IkamvaYouth.

It is precisely with respects to the robustness of the estimates that this current study improves on *Against the Odds*. This study estimates IkamvaYouth's contribution to the performance of its learners – the 'Ikamvanites' – in five matric subjects: English as a First Additional Language (hereafter simply referred to as 'English FAL'), Mathematics, Mathematical Literacy, Physical Sciences and Life Sciences. In Section 1, these estimates are obtained for the full sample 2014 cohort of grade 12 learners residing in the five provinces containing matriculating Ikamvanites – for these estimates no attempt is made to control for learners' past performance. As is discussed below, the Section 1 estimates suggest that IkamvaYouth has had an immense impact on the performance of its learners. However, it is in Section 2 that this study provides evidence of the robustness of this result. Here the effectiveness of the programme is estimated for a sub-set of Western Cape learners who could be matched to the 2011 Systemic Test results; these test results are used to control for the past performance of these learners. This procedure, as is detailed below, may actually introduce more problems than it solves, but it is argued that these estimates provide a suitable lower-bound estimate of the effectiveness of IkamvaYouth. In combination, it lends support to the main finding that IkamvaYouth seems to have a major impact on the performance of its learners.

Section 1: Estimates Based on Full Sample (All Five Provinces)

1.1: Data and Regression Specification

Information on the performance of South Africa's 2014 cohort of matriculants was obtained from the 2014 official matric results for the Western Cape, KwaZulu-Natal, the Eastern Cape, North-West Province and Gauteng. As stipulated above, this evaluation only considers the performance of Ikamvanites in English FAL, Mathematics, Mathematical Literacy, Physical Sciences and Life Sciences; data on the performance of learners in all other subjects was thus dropped from the dataset. For all regression outputs included in this evaluation, the included subjects are respectively referred to as *English FAL*, *Mathematics*, *Math. Lit.*, *Physics*, and *Life Sci.* Note then when written without italics subject names refer specifically to the subject rather than the 2014 data for each subject (and vice versa for subject names written in italics).

243 Ikamvanites were identified in this data by their exam numbers, obtained from IkamvaYouth's database. This information was used to generate a variable, *Ikamvanite*, which takes on a value of one if a learner was an IkamvaYouth participant upon completion of matric (and a zero otherwise). This approach – i.e. using a binary variable (that either takes on a value of zero or one) rather than a variable that indicates the length of exposure to the programme – is advantageous for its simplicity. In the regression outputs discussed below, the coefficient estimate for the binary variable *Ikamvanite* may simply be interpreted as the average benefit derived from participation in the IkamvaYouth programme, expressed in the units of the dependent variable (which, in all cases, is either *English FAL*, *Mathematics*, *Math. Lit.*, *Physics*, or *Life Sci*).

Regarding the units of the dependent variables, learners' scores in these five subjects are recorded in the official matric data as percentages. In accordance with common practice, these variables where standardized using the following transformation:

$$Z_i = \frac{X_i - \overline{X}}{\sigma_X}$$

wherein Z_i is learner i's standardized score for subject X, X_i is learner i's score for subject X expressed as a percentage, $\overline{X}$ is the average of all learners' scores in subject X, and σ_X is the standard deviation of learners' scores for subject X. Standardizing learners' scores simply ensures that the average score (of zero) and standard deviation (of one) is the same for all subjects.

Using standardized dependent variables is advantageous in that regressing on them produces coefficients expressed in standard deviations. In other words, the effect sizes estimated in these regressions will be expressed as a proportion of the distribution of the relevant dependent variable (*English FAL*, *Mathematics*, etc.). This makes estimated effect sizes for dependent variables with tight distributions (such as *English FAL,* which has a standard deviation of 10.56, as can be seen in Table A1.1,) and wide distributions (such as *Mathematics*, which has a standard deviation of 19.03) comparable.

The downside of using standardized scores is that the interpretation of the coefficient estimates is less intuitive than for coefficients expressed in terms of percentage points. Illustrating by way of an example, the correct interpretation of a coefficient of 0.502 on *Ikamvanite*, produced from regressing *English FAL* on *Ikamvanite* (Table A1.1, column A1.1.1) would read as follows: "Participation in the IkamvaYouth programme yields an estimated 0.502 standard deviations improvement in learners' *English FAL* scores". However, the estimated effect size can be easily converted from standard deviations to percentage points by simply multiplying the estimated coefficient by the standard deviation of the dependent variable; this will be done for the most important results discussed below.

Turning now to issues of estimation, all of the regressions discussed below conform to the same simple setup. In each regression, learners' scores in one of the five subjects under consideration (the dependent variable) are regressed on *Ikamvanite* and a selection of control variables. For those less familiar with the technical workings of OLS regression analysis, control variables are used to account for systematic differences between learners which would otherwise obscure the effect that is of interested here. Explaining by way of a hypothetical example, if *Physics* is regressed on *Ikamvanite* without adding any control variables, it might be found that the resulting coefficient estimate for *Ikamvanite* – i.e. the estimated effect of participation in the IkamvaYouth programme – is small and negative. This of course is not because the programme negatively affects the performance of its participants.

Without control variables, OLS regression analysis simply compares the average score of the learners captured under *Ikamvanite* with the average score for all other learners. This would be fine if non-participants were good counterfactuals for how Ikamvanites would have performed had they been non-participants, but this is clearly not the case. By design, IkamvaYouth reaches out to learners who are faced with numerous disadvantages and impediments to learning, and on the basis of these disadvantages one might expect Ikamvanites to underperform relative to the average performance of other learner, even with the assistance of the programme. Adding relevant control variables can help to remove such impediments to estimation. As their name suggests, control variables 'control away' the impact of other factors that determine learners' performance, thus improving the comparability between otherwise very different learners.

Regarding the aims of this evaluation, Ikamvanites should be made as comparable as possible with all non-participants, as under these conditions the estimates of the impact of the programme will be generalizable as a prediction of the added benefit that will be derived from the programme if it is expanded further. Thus a set of control variables is added in an attempt to account for important systematic differences between Ikamvanites and non-participants. In this regard, all estimates discussed in section 1.5 include control variables for race, province, schools' socioeconomic status using the national quintile, whether or not schools charge school fees, schools' language of learning and teaching, learners' gender, any history of grade repetition, learners' home language, and whether children are immigrants or have special needs. In addition to these control variables which were included in the official 2014 matric data, one additional control variable is generated, *Ikamva Schools*, which takes on a one for all learners who attend a school attended by at least one Ikamvanite. In combination, these demographic control variables give some indication of the resources available to learners and their background, thus addressing many of the avenues that might lead one to underestimate the effectiveness of IkamvaYouth. Note that estimates discussed under Section 2 of this report contain the same list of control variables, barring the provincial variables (the sample for that Section 2 is restricted to the Western Cape) and the ‘repeater’ variable (as students with a history of grade repetition could not be matched with data documenting their prior performance).

Finally, before moving on to a discussion of the estimates presented in Appendix A and Appendix B, it is worth briefly noting here that there are several factors not accounted for in this battery of control variables that might still bias the estimates away from the true effect of the programme. Specifically, learners’ motivation, a key determinant of performance which might be correlated with the uptake of the programme (and which would thus cause one to overestimate the effectiveness of the programme), is not accounted for here. This issue will be returned to in Section 2 of this evaluation, wherein it is demonstrated that this factor may not have a very large impact on the estimates presented here in Section 1.

1.2: Notes on Interpretation and Limitations

Descriptive statistics and regression outputs obtained for the whole sample of learners from the five provinces included in this study are reported in Appendix A. Appendix B includes the same set of descriptive statistics and regression outputs, again estimated using the data from all five provinces but excluding the top quintile of schools. Omitting quintile five schools was done for reasons similar to those discussed with regards to the inclusion of control variables. As discussed above, the validity of the estimates is contingent on the extent to which non-participants in the sample resemble a good counterfactual for the performance of Ikamvanites had they not been given access to the programme. In principle, controlling for whether or not a learner attended a quintile five school should be sufficient to capture the effect of this difference between learners, but given the evidence which suggests that South Africa’s educational system is *de facto* divided into a well-functioning high SES system and a dysfunctional low SES system (Spaull, 2013) it may be more appropriate to omit those learners who might be drawn from a fundamentally different data generating process.

For the estimates presented in this section, it must be remembered that participating learners’ academic performance prior to joining the programme has not sufficiently been accounted for. If the learners who decided to participate in the IkamvaYouth programme were outperforming their otherwise similar peers (due to more motivation or greater innate ability) prior to joining the programme, these estimates would overstate the effectiveness of IkamvaYouth. This of course would undermine the reliability of these estimates as an indicator of how effective the programme will be if it is expanded. As is discussed in Section 2, this source of bias is probably not too great a source of concern, but regarding the generalizability of these results, it is worth keeping in mind that these estimates capture the effect of the IkamvaYouth intervention for motivated learners. Consequently, expanding the reach of the programme within schools will likely see diminishing returns to the performance of new learners as the pool of motivated learners yet to join the programme decreases. Expansion to new schools, i.e. to new pockets of unassisted motivated learners, will likely result in similarly large improvements for these new learners. *In other words, these estimates yield a plausible indication of the impact that a lateral expansion of IkamvaYouth to new schools might have, but would likely overstate the gains from a continuous deepening of the programme at already participating schools.*

1.3 Descriptive Statistics

Table A1.1, A1.2 and A1.3 respectively display the average matric scores of the 2014 Ikamvanites, their feeder schools, and all other schools in each of the five subjects under consideration. The results for the IkamvaYouth feeder schools include the Ikamvanites' scores, but excluding them makes little difference, given that they account for a very small proportion of the learners who attended their schools. Comparing Table A1.1 and Table A1.2, Ikamvanites on average over perform relative to their feeder school peers in all five subjects; the largest margin is nearly eight percentage points (for *Life Sciences*), and the smallest margin is approximately 3.5 percentage points (*Mathematical Literacy*). Comparing the average performance of Ikamva feeder schools (Table A1.2) with the average performance of the full sample of learners (all five provinces, all school quintiles), the feeder schools outperform the full sample average for *English FAL* and underperform in all of the other subjects. The performance of these schools in *English FAL* may simply reflect their urban location (note that information on the location of schools was not available in the dataset), with urban learners experiencing more exposure to English.

Table B1.1, B1.2 and B1.3 display average scores for the same categories (Ikamvanites, feeder schools and full sample respectively), but omitting quintile five. Omitting learners who attended quintile five schools has almost no impact on the average scores of Ikamvanites. Much larger changes were observed for the average performance of Ikamva feeder schools (Table B1.2) and the full sample of learners (Table B1.3), and in these cases all changes were negative. Thus, after accounting for the influence of quintile five schools' learners, Ikamvanites continue to outperform both their feeder school peers and their matric cohort.

Figures A1.1 to A1.5 and figures B1.1 to B1.5 visually represent these findings, separating out the performance of quintile five schools' learners, learners from quintile one-to-four schools, the Ikamvanites and their feeder schools. For Figure A1.1 to Figure A1.5, the score distributions for Ikamvanites and their feeder schools include learners drawn from quintile five schools, whereas those in Figure B1.1 to Figure B1.5 exclude quintile five. In all of these figures, zero represents the average (standardized) scores for all learners – thus it is apparent where the bulk of learners in any of these four categories lie relative to the average performance of all learners. In some of these distributions there is a bulge at the far left of the distribution – the area under this portion of the distribution largely reflects learners who scored zero percent in the subject under consideration.

Throughout Figure A1.1 to Figure A1.5 several patterns are evident. In all instances, the school quintile one-to-four learners are distributed towards the lowest end of the performance spectrum, followed by the Ikamva feeder schools. Ikamvanites outperform these two groups, but their scores remain notably to the left of quintile five schools' learners' scores. One exception here is in *Life Sciences,* where Ikamvanites perform very similar to quintile five schools. Remarkably, this remains the case in Figure B1.5 (which excludes Ikamvanites drawn from quintile five schools). Moreover, comparing the results from tables A1.1 through A1.3 with those of tables B1.1 to B1.3, Figure B1.1 to Figure B1.5 demonstrates that removing the learners from the top school quintile substantially lowers the performance of Ikamva feeder schools. Comparing Figure B1.1 to Figure B1.5 with Figure A1.1 to A1.5, it is apparent that once the quintile five learners are removed from the distribution for Ikamva feeder schools their score distributions very closely resemble those of learners drawn from the bottom four school quintiles. However, this exclusion produces very little (if any) negative impact on the distributions for Ikamvanites.

1.4 Notes on Interpreting Regression Outputs

All tables which contain regression outputs are laid out as follows: Each column corresponds to a single regression; the number listed above each column uniquely identifies that regression. The dependent variable for each regression (be it *English FAL*, *Mathematics*, etc.) is indicated below the number identifying the regression. The left hand column in each table of regression outputs lists the most important independent variables included in those regressions[1] – in almost all cases this includes *Ikamvanite*, but it may also include variables such as *Ikamva Schools* and, in later outputs, *Mathematic SYS* and *Language SYS* (learners' Systemic Test scores for Mathematics and their home language respectively). Numbers listed to the right of an independent variable are the coefficient estimates for that independent variable. Each coefficient estimate is located in the column which corresponds to the relevant regression (and hence dependent variable).

Demonstrating the above with an example, in Table A2.1, column A2.1.5 corresponds to the regression of *Life Sci.* on *Ikamvanites* and all of the control variables discussed in Section 1.1 (excluding *Ikamva Schools*). The coefficient estimate for *Ikamvanite* which corresponds to the dependent variable *Life Sci.* is 0.464. As discussed above, a correct interpretation of this coefficient reads: "Participation in the IkamvaYouth programme yields an estimated improvement in learners' scores of 0.464 standard deviations".[2]

In all regression outputs, asterisks indicate the statistical significance of the coefficient estimate for the relevant dependent variable. As explained in the footnote attached to the heading of Table A2.1, statistical significance at the one, five and ten percent level is

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[1] All other control variables were omitted for formatting purposes – for the complete list, see page 4.

[2] For those results presented in this section which have not been converted to percentages, the information which should be used to convert them is captured either under Table A1.3 and Table B1.3. As per the division of the appendixes, Table A1.3 lists standard deviations calculated using data from the performance of all learners from all five provinces, and Table B1.3 lists the same information calculated without the top quintile of learners. To convert the coefficients reported in all other tables to percentage points, multiply the coefficient by the appropriate standard deviation. For example, the coefficient estimate on *Ikamvanite* for *English FAL* in Table A2.1 is 0.503, and Table A1.3 indicates that *English FAL* has a standard deviation of 13.75 percentage points. Thus, the estimate in Table A2.1 indicates an average expected gain for Ikamvanites of approximately 6.9 percentage points in their scores for *English FAL*.

indicated with three, two or one asterisk(s) respectively. Statistical significance gives an indication of how confident one can be that the actual size of an estimated coefficient is not zero. Illustrating by way of an example, consider the coefficient on *Ikamvanites* in column A2.1.5; one can see that this variable is significant at the one percent level – this, as explained above, is indicated by the three asterisks next to it; one can thus interpret this as saying that "there is no more than a one percent chance that this effect size is actually zero".

Each coefficient's estimated standard error is reported in brackets below the relevant coefficient estimate. The standard errors are used to estimate the statistical significance of the reported coefficient and need not be explicitly considered for the purposes of interpretation; they have been included for the sake of completeness and transparency. The R-squared, which is listed for every regression, indicates the proportion of the variation in the dependent variable which is explained by the observed variation in the independent variables included in the regression. A high R-squared indicates that the independent variables included in the regression explain a lot of the variation in the dependent variable. Thus, for example, the R-squared for regression A2.1.5 indicates that the independent variables included in that regression explain 13.8 percent of the variation in *Life Sci.* marks. Having fully explained the significance of all of the components included in each table of regression outputs, attention now turns to interpreting them.

1.5 Discussion of Initial Estimates

Overall, the estimates presented in Appendix A and Appendix B essentially corroborate the findings described in Section 1.3. Participation in the IkamvaYouth programme is generally associated with substantial gains in all subjects. Table A2.1 shows estimates for returns to participation in the programme, accounting for the control variables listed in Section 1 but excluding the variable *Ikamva Schools*; estimated gains range from between 0.258 standard deviations for *Physics* and 0.502 standard deviations for *English FAL*. These gains are remarkably large. To put the magnitude of these estimates in context, Spaull and Kotzé (2015:20) note that a 0.30 standard deviation change in the Mathematics scores of South African primary school learners is considered approximately equal to one year's worth of learning. Note that these initial estimates are slightly smaller if the top school quintile learners are removed from the sample (see Table B2.1), but remain substantial (with a high of 0.502 for *English FAL* and a low of 0.264 for *Mathematics*).

As discussed in Section 1.3, there is some indication that Ikamva feeder schools generally outperform other lower-quintile schools in terms of their scores in *English FAL*. In Table A2.2 and B2.2, each of the five subjects is regressed on the battery of control variables listed in Section 1.1 and the variable *Ikamva Schools*. Note that *Ikamvanite* has been omitted from these regressions; the intent here is to make the differences between Ikamva feeder schools and other schools as apparent as possible. In this regard, Table A2.2 and B2.2 clearly indicate that Ikamva feeder schools tend to outperform other schools in terms of their *English FAL* scores. Table A2.2 also indicates that these Ikamva feeder schools tend to underperform relative to other schools in *Physics* and *Life Sci.*, though these differences are not statistically significant if the upper quintile of learners is removed (Table B2.2). In contrast with the estimates for other subjects, the markedly strong performance of Ikamva feeder school learners in *English FAL* is conspicuous. As was noted earlier, it is probably a product of location of these schools in or near urban centres, which could not be explicitly controlled for in any of the regressions considered here due to data constraints.

Table A2.3 and Table B2.3 present estimates of the performance of Ikamvanites, accounting for the average performance of their feeder schools. As can be seen in these tables, controlling for *Ikamva Schools* substantially reduces the estimated impact of the IkamvaYouth programme on learners' performance in *English FAL*, but the estimated effect is still large (0.364 standard deviations in Table A2.3 or 0.355 in Table B2.3). Other than this downward adjustment, only one other estimated effect is reduced when *Ikamva Schools* are included in the regressions: the coefficient for *Physics*, which now exhibits the lowest estimated effect, is revised downward from 0.302 standard deviations in Table B2.1 to a still-substantial 0.293 standard deviations in Table B2.3. All other coefficients increase if this additional control variable is added in the estimates (compare Table A2.1 with Table A2.3, and Table B2.1 with Table B2.3) with *Life Sci.* showing the highest estimated effect of 0.525 standard deviations (in Table B2.3 – i.e. the estimate excluding learners who attended quintile five schools).

Though the estimates recorded in Appendix A are presented for completeness sake, Appendix B contains the most reliable estimates, as they were obtained using a sample of learners which is more likely to resemble an acceptable counterfactual for participating Ikamvanites. For convenience sake, Table 1.1 provides the estimated percentage point change in learner scores for each of the five subjects, obtained via a transformation of the estimates presented in Table B2.3 using the standard deviations reported in Table B1.3. The estimated contribution of IkamvaYouth to the performance of Ikamvanites ranges between 4.9 percentage points for *English FAL* up to a near symbol improvement in *Life Sic.* (9.8 percentage points).

Table 1.1: Outputs from Table B2.3 Expressed in Percentage Points

	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	4.9	7.1	6.9	5.9	9.8

Section 2: Restricted Sample Estimates, with Systemic Test Results

2.1 Data, Matching and Sources of Bias

As discussed in Section 1.2, there is reason to be concerned that the estimates presented in the Section 1.4 overestimate the effectiveness of IkamvaYouth. Learners who joined IkamvaYouth may have done so because they were highly motivated, high-performing learners prior to joining the programme. If so, the large estimated effects presented in Appendix A and Appendix B would not be representative of the impact of the programme. The estimates presented in this section attempt to control for this source of upward bias by including control variables for learners' performance prior to matric. To accomplish this task it was necessary to match the dataset containing learners' matric results with data indicating learners' performance in a previous assessment.

Data availability posed a substantial constraint in regards to carrying out this task. It was not possible to obtain data that would make it possible to retain the sample of five provinces; as learners in the 2014 matric cohort did not participate in the Annual National Assessment test, the only national test that may have been suitable for this task. In lieu of a national test, the

2011 Western Cape Systemic Test written in grade 9 was the only dataset available to match with the sample of 2014 matriculants, thus the next part of the analysis relates to this province only. Matching was conducted using learners' first name, surname, date of birth and gender.

Matching the 2014 matric cohort with the 2011 Systemic results reduced the sample in two respects. Firstly, the provincial nature of the Systemic Test restricted the sample to the 48 827 matriculants in the Western Cape sub-sample of 2014 matriculants. The sample was reduced even further in the matching process, as only those who could be matched with their 2011 Systemic Test results could be included in the final dataset of matched learners. This restriction reduced the total sub-sample of Western Cape matriculants from 48 827 learners to 30 258 learners, and reduced the total sample of Western Cape Ikamvanite matriculants from 65 learners to a mere 38 learners (which drops further to 35 learners if quintile five schools' learners are excluded).

Several issues arise from the restrictions imposed by the matching process. Firstly, the small sample of remaining Ikamvanites makes it unlikely that a statistically significant result will be found regardless of the effectiveness of the programme. This follows from the inverse relationship between sample size and estimation accuracy (standard errors) of coefficient estimates. With such a small sample, even a large actual effect will be inaccurately estimated and will thus probably be statistically insignificant. As discussed below, finding that even a few of these estimates are statistically significant under these stringent conditions is an immensely positive result.

In addition to reducing the accuracy of the estimates, restricting the sample as was done here has likely introduced sample selection issues which will bias estimates downward. Issues of sample selection arise when a sample is non-randomly selected. If selection is non-random, as it is here, the learners who remain in the sample may not resemble a good counterfactual for the performance of Ikamvanites had they been non-participants, even after account for available control variables.

There are at least three ways in which the matching process might have induced sample selection bias into the estimates. Firstly, given that the Western Cape branches of IkamvaYouth are the founding and most well-established branches of the programme, basing the estimates of the effectiveness of IkamvaYouth solely on the performance of its Western Cape learners could induce an upward bias in the estimates. However, available data indicates that there is no such bias. Firstly, compare the average performance of Western Cape Ikamvanites (Table C1.1 or Table D1.1) with the average performance of the full 2014 sample of Ikamvanites (Table A1.1 or Table B1.1). In all five subjects, and for both the sample including and excluding quintile five schools' learners, the average scores of the Western Cape Ikamvanites are lower than the average scores for all Ikamvanites. This is the opposite of what one would expect to find if the Western Cape IkamvaYouth branches were more effective than those in other provinces. Furthermore, as will be shown shortly, a comparison of estimates of the effectiveness of the programme obtained for the restricted and unrestricted sample of Western Cape learners suggests that this potential source of upward bias is probably less important than two other sources of downward bias.

The second source of sample selection bias also follows from the restriction of these estimates to Western Cape learners, but here this restriction will bias estimates downward. The Western Cape is generally a very high SES province, but IkamvaYouth focus specifically on uplifting learners from low SES backgrounds. On account of the Western Cape's demographics, it is likely that many of the non-participants included in the sample are bad counterfactuals. They may look similar to Ikamvanites in terms of the available data, but they may differ vastly in terms of omitted variables – specifically learners' SES – in a manner that will induce a downward bias in the estimates. While it cannot be certain that this source of bias is present in the estimates, the Western Cape is clearly the province in which this is most likely to occur and thus one should be aware of this possibility. This issue can however be addressed to a reasonable extent by simply omitting quintile five schools' learners. Hence the practice followed in Section 1 is repeated wherein each estimate is run twice, once including quintile five schools' learners (captured under Appendix C) and once omitting them (captured under Appendix D).

An important and less readily solvable third source of downward bias inherent to the matched sample follows from the fact that learners who could be matched with their 2011 Systemic Test results probably differ systematically from many of the learners who could not be matched. The argument supporting this claim runs as follows:

1. Approximately forty percent of the Western Cape's 2014 cohort of matriculants could not be matched with their 2011 Systemic Test results, and were thus omitted from the reduced sample.
2. Learners could only be matched with their Systemic Test results if they were in grade 9 in 2011 and were in matric in 2014. Thus, any learner who repeated a year between grade 9 and matric could not have been matched. Given the high proportion of South African learners who fail a year between grade 9 and matric, it is likely that most of the 2014 matriculants who were not matched could not be matched because they repeated at least one year between grade 9 and matric.
3. Given point 2, it follows that learners who were matched with their 2011 Systemic Test results differ from those learners who were not matched. These differences are of particular interest to use for matched learners who did not perform well in the Systemic Test. Specifically, learners who performed poorly in the 2011 Systemic Test but nevertheless reached matric by 2014 might tend to be more highly motivated on average than their similarly low-scoring unmatched peers. Alternatively, their success might be attributable to higher than average innate ability, or to assistance from private tutors or some intervention programme received after grade 9. Whatever the explanation, given the structure of the matching process one would expect matched learners to differ from unmatched learners in respects that are positively related to greater academic success. These claims are substantiated by Table C1.2, C1.3, D1.2 and D1.3, where Tables C1.2 and C1.3 show the mean performance of both the matched (restricted) and unmatched (unrestricted) samples of Western Cape Ikamva feeder school learners (C1.2) and the entire sample of Western Cape learners (C1.3) for all five subjects (D1.2 and D1.3 are similarly constructed, but they omit all learners who reportedly attended a quintile five school). In all four tables and in every one of the five matric subject therein, the average scores for the restricted (matched)

sample of learners are substantially higher than those of the unrestricted (unmatched) sample of learners, both for Ikamva feeder schools and for the entire 2014 Western Cape cohort of matriculants. (The average score of those learners who were not matched must thus be even lower than the average score for all learners in each subject.)

4. Following the argument made under points 2 and 3, matched learners that participated in the IkamvaYouth programme (point 2) must have written the Systemic Test in 2011 and proceeded to grade 12 by 2014, but (point 3) they may not have managed to do so if they had not participated in the programme.
5. However, these Ikamvanites are being compared with learners who were able to pass each subsequent year without the assistance offered by IkamvaYouth, possibly because many of them were in fact very motivated or able learners, or because they had access to other channels of assistance or resources (point 3).
6. Thus it is likely that the impact of IkamvaYouth is understated by estimates which control for learners' Systemic Test results. Ikamvanites did not perform well in the 2011 Systemic Test: Table C2.1 show that they averaged 42.31 percent for the language test segment and 21.40 percent for the numerical test segment, both of which are well below their feeder schools' average scores and even further below the matched learners' provincial averages; Table D2.1, which excludes quintile five schools, shows that Ikamvanites achieved an average in both segments that is nearly identical to that of their feeder schools (41.3 for language, 20.9 for numeracy), and which remains below the matched learners' provincial average. As discussed, other low-scoring matched learners may on average owe some of their success to factors (motivation, ability, home SES, external assistance, etc.) that the Ikamvanites do not have access to. Thus, other low-scoring learners may be a bad counterfactual for Ikamvanites scores had they been non-participants – controlling for the Systemic Test results in this restricted sample may thus cause the estimates to be biased downward.

As a last point regarding sources of downward bias, it is also worth noting that subject choices may introduce further issues of sample selection which may be present no matter which sample is estimated on. IkamvaYouth encourages its learners to take Mathematics and

Physical Science – these are difficult subjects and Ikamvanites may not have decided to attempt them had it not been for the prompting of IkamvaYouth. However, other learners who decided to take these subjects also did so in a non-random manner. Their decision to take any one of these two subjects was likely derived from their beliefs about their own capacities, their goals, and possibly by prompting on the part of their parents. Note that there is evidence of this hypothesis in the data: the gap between the average scores for matched learners and the full sample of learners for *Mathematics* and *Physics* is, as can be seen in Table C1.3 and Table D1.3, smaller than the gaps between these groups for all other subjects. Moreover, the proportion of learners who were matched is highest (by a substantial margin) for *Mathematics* and *Physics*, even the upper quintile of learners is excluded (see Table C1.3 and Table D1.3 – this information can be ascertained from the number of observations listed for each subject). Those who selected into these subjects thus appear to be more capable of passing lower grades than learners who did not enrol in one of these two (more difficult) subjects. As discussed prior, self-selection of this sort would introduce a systematic difference between the Ikamvanites and the learners they are compared with, which would in this instance cause an underestimate of the effectiveness of the programme.

In addition to the arguments and anecdotal evidence discussed above, it is actually possible to observe the downward-biasing impact of these factors. To see this, refer firstly to Appendix C section C3 and Appendix D section D3. These sections each contain five tables, where each table corresponds to one of the five subjects considered in this evaluation. The first column in each of these tables shows estimates of the returns to participation in the programme in each of the five subjects for the restricted sample of learners, without controlling for learners' past performance. Barring the coefficient estimate in Table D3.5 (*Life Sci.*, excluding quintile five schools) none of these estimates are statistically significant, and all of the estimates are smaller than those obtained for the entire sample of 2014 matriculants.[3] The estimate for *Physics* (in Table C3.4 and Table D3.4) has even become negative. Note furthermore that the third columns of each of these tables show that similar

[3] With the unreliable exception of the coefficient estimate for *Math. Lit.* in Table C3.3 and Table D3.3, which, given the very small sample of seven learners used to estimate this coefficient, is suspiciously large and significant.

results are observed when *Ikamva Schools* is added to these regressions. What is important to note here is that these estimates *do not* control for learners' past performance; in other words, these small and statistically insignificant coefficients reported in the first column of each of these tables are not a result of accounting for learners' motivation.

Now refer to Appendix E (includes quintile five schools) and Appendix F (excludes quintile five schools). Appendix E and Appendix F also both contain five tables (Table E1.1 to Table E1.5 and Table F1.1 to Table F1.5) each of which corresponds to one of the five subjects included in this evaluation. Each of these tables contain two sets of two coefficient estimates for *Ikamvanite*. These sets divide estimates which do not control for *Ikamva Schools* (the first two columns of each table) from those that do control for *Ikamva Schools* (the last two columns in each table). The left hand column in each set is the estimate obtained using the unmatched Western Cape sample of 2014 matriculants, and the right hand column simply re-reports the corresponding restricted sample estimates presented in either the first or third column Table C3.1 to Table C3.5 and Table D3.1 to Table D3.5.

Simply stated, the tables in Appendix E and Appendix F allow a comparison of the estimates just discussed (which were obtained from the restricted or matched sample of Western Cape learners) with estimates obtained for the full sample of Western Cape learners. Comparison shows that in all instances (again barring *Math. Lit.*) the restricted sample coefficient estimates for *Ikamvanite* lie well below the unrestricted sample estimates. Note once again that these differences are not as a result of controlling for learners' motivation – none of these regressions contain control variables for learners' Systemic Test performance. Rather, this observed drop in the coefficient estimates is the product of the downward-biasing sample selection issues discussed above.

In sum, the estimates discussed here should be interpreted in light of the small sample of participants they are based on, as well as the prevalence of downward bias introduced by the issues of sample selection.

2.2 A 'Lower-Bound' Estimate of the Effectiveness of IkamvaYouth

Keeping in mind that the issues of sample selection bias discussed above have not been resolved, the estimates of the effectiveness of the programme obtained with control variables for learners' past performance are now discussed. Referring again to Table C3.1 to Table C3.5 and Table D3.1 to Table D3.5, the second columns of these tables show the estimated impact of participation in the programme controlling for learners' language and numeracy scores for the 2011 Systemic Test. In all instances (barring the effect for *English FAL*, which decreases, and *Life Sci.*, which remains constant), controlling for learners' past performance increases the estimated returns to participation in the programme. This result is particularly interesting in that the rationale behind including control variables for learners' past performance was to prevent upward bias in the estimates of the effectiveness of the IkamvaYouth programme. The increase in the estimated effectiveness of the programme stemming from the addition of controls for learners' prior performance again implies that the estimates presented in column one of these ten tables are subject to substantial downward bias, to an extent that far outweighs any upward bias stemming from exceptional motivation or ability on the part of Ikamvanites.

Furthermore, with the inclusion of controls for learners' prior performance the estimate for Ikamvanites' scores in *English FAL* is now significant at a ten percent level (in Table C3.1 and Table D3.1), and the estimates for Ikamvanites' scores in *Math. Lit.* and *Life Sci.* are significant at a five percent level of statistical significance (Tables C3.3, D3.3, C3.5 and D3.5). These findings are impressive, especially considering that, of the Ikamvanites captured in this dataset, only 34 Ikamvanites wrote English FAL and 34 wrote Life Sciences. Furthermore, only seven Ikamvanites wrote Mathematical Literacy, but this result seems too good to be true. The large estimated impacts on *Math. Lit.* recorded in Table C3.3 and Table D3.3 may for instance be a product of Ikamvanites dropping from Mathematics to Mathematical Literacy, in which case it may not be fair to attribute these learners' success to the programme. Nevertheless, the increased magnitude and improved statistical significance of these estimates, observed with the addition of controls for learners' prior performance, are encouraging indicators of the effectiveness of the programme.

Lastly, estimates presented in the fourth column of Table C3.1 to Table C3.5 and Table D3.1 to Table D3.5 include *Ikamva Schools* to control for the overall performance of schools attended by Ikamvanites. Here, all of the estimates other than those for *Life Sci.* in Table D3.5 and for *Math. Lit.* in Table C3.3 and D3.3 lose their statistical significance. Furthermore, barring the estimate for *Physics* in Table C3.4, for *Mathematics* in Table D3.2, and for Life Sci. in Table D3.5, the magnitudes of all estimates diminish in size.

This development seems discouraging, but is actually a result of several explicable technical factors. As regards the loss of statistical significance, the statistical significance of an estimate is partly determined by (and negatively related to) the correlation between the independent variables included in the model. As the correlation between these independent variables increases, the statistical significance of these variables decrease, regardless of the true magnitude of the impact of the programme on these variables. *Ikamva Schools* is correlated with *Ikamvanite* by construction (with a correlation coefficient of 0.1564), and thus, also by construction, including *Ikamva Schools* decreases the accuracy of the estimated impact of the programme.

It is also worth noting that because these variables are correlated by construction – in that the performance of Ikamvanites is partially responsible for the performance of the schools where they are enrolled –, controlling for the overall performance of Ikamvanites' schools can induce some degree of downward bias in the estimates of the effectiveness of the programme. In illustration of the consequences of this induced correlation, it is worth discussing the differences between the effect that this control variable has on the estimated impact of the programme in terms of Ikamvanites' scores in *Physics* (as recorded in Table C3.4; note that this argument applies equally for *Mathematics* in Table D3.2 and *Life Sci*. in Table D3.5) compared with that implied by estimates obtained from their scores in other subjects. For the estimates included in Appendix C, Physical Sciences is the only subject wherein the estimated impact of the programme increases (it in fact doubles) when one includes *Ikamva Schools*. One can also see (in column C3.4.4) that in the regressions of *Physics* on *Ikamvanites* and *Ikamva Schools*, *Ikamva Schools* was found to have an overall negative correlation with learners' performance. Thus, for the estimates on *Physics* in Table C3.4, the positive correlation between *Ikamvanite* and *Ikamva Schools* would bias the coefficient on *Ikamvanite* downward if *Ikamva Schools* is omitted. For all other estimates in Appendix C, correlation between *Ikamva Schools* and the respective subject is positive (1), and correlation between *Ikamvanite* and *Ikamva Schools* is, as always, positive by construction (2). From (1) and (2), it follows that the inclusion of *Ikamva Schools* will, by construction, lead to at least some degree of downward bias in the estimated impact of the programme, but it may also control for upward bias stemming from uncontrolled-for school-wide differences in learners' performance between feeder schools and non-feeder schools. In Appendix C, for all subjects other than Physical Sciences, the change in the estimated impact of the programme induced by the inclusion of *Ikamva Schools* is negative, as hypothesised, but is quite small (perhaps barring the effect observed for Life Sciences in Table C3.5). It is possible then that for these subjects the variable *Ikamva Schools* may induce more bias than it reduces, and it may thus be more sensible to omit this variable in these estimates. Note of course that this argument applies equally well to the estimates reported in Appendix D.

Finishing off this section, the magnitude of the coefficient estimates reported here is considered. Focusing on the outputs recorded in Table D3.1 to Table D3.5 (which as discussed above are deemed more reliable for omitting learners who attended quintile five schools), the coefficient estimates presented here are smaller than the comparable full sample estimates reported under Table B3.3 (disregarding the estimated effect for *Math. Lit.* in Table D3.3). They are also statistically insignificant, but as discussed above, this simply reflects the small number of observations included in the estimates. What is important to note here is that, barring the estimate for *Physics*, the magnitudes of these estimates are still quite large. This is in spite of the numerous reasons why these estimates are likely to under-state the effectiveness of the programme.

Finally, for convenience, the estimates presented in column four of Table D3.1 to Table D3.5 are presented in Table 2.1, expressed in percentage points. As can be seen here, these numbers are not trivial, especially in *Life Sci.* and even in *Mathematics*. Moreover, even smaller magnitudes should not be regarded as a negative finding. On account of the numerous sources of downward bias discussed above, and given that by controlling for learners' prior performance the most important possible source of upward bias has been corrected for, these estimates should essentially be regarded as lower bound estimates of the impact of IkamvaYouth in each of these subjects.

Table 2.1: Outputs from Tables D3.1 to D3.5 Column Four Expressed in Percentage Points

	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	2.29	3.26	7.45	0.70	5.45

Conclusion

Overall, the estimates discussed in Section 1 and Section 2 of this report suggest that the IkamvaYouth intervention has been highly effective with regards to its impact on the performance of its participants. The estimates presented in Table 1.1 indicate large average improvements for Ikamvanites in all five subjects, ranging from just under five percentage points for English FAL and up to just shy of ten percentage points for Life Sciences. Improvements of the magnitude seen in English FAL, which shows the lowest percentage point improvement, may equate to as much as a year's worth of learning. However, some hesitancy should be exercised in accepting the validity of these estimates, as they do not account for the prior performance of IkamvaYouth participants.

On account of this hesitancy, Section 2 re-conducts these estimates on the sub-sample of Western Cape learners who could be matched with their 2011 Systemic Test results. As discussed in Section 2.1, this course of action introduces some new data and sample selection problems. For a variety of reasons discussed in Section 2.1, the remaining sub-sample of non-participants differ very much from the few Ikamvanites which were retained in the sample, and these differences make these remaining learners a bad counterfactual for the performance of Ikamvanites had they been non-participants. It is demonstrated that this almost certainly ensures that the estimates presented in Section 2 suffer from substantial downward bias. Furthermore, the inclusion of control variables for learners' Systemic Test results makes it unlikely that the estimates discussed in Section 2 are biased upwards. Thus these estimates, particularly those presented in Table 2.1, are useful as lower-bound estimates, but they almost certainly under-estimate the effectiveness of the programme.

Thus the results presented in Table 2.1 can be interpreted as very positive findings. In particular, the estimates for *English FAL*, *Mathematics* and *Life Sci.* are still substantial (as discussed, one should not read too much into the highly positive *Math. Lit.* estimate). Only *Physics* shows no impact from participation in the programme; as discussed, this is probably a reflection of additional sources of bias (stemming from issues of self-selection) that may afflict the estimated for Mathematics and Physical Sciences. Thus, overall, the findings suggest that IkamvaYouth does indeed add substantially to the performance of its learners, helping them to succeed against the odds.

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Appendix A: Unmatched, All Provinces

A1: Descriptive Statistics

Table A1.1: Ikamvanites 2014 Matric Results

	Mean	Std. Dev.	Observations
English FAL	55.62	10.56	202
Mathematics	37.40	19.03	154
Mathematical Literacy	46.89	13.19	89
Physical Science	38.66	17.36	122
Life Sciences	48.37	17.87	154

Table A1.2: Ikamva Feeder Schools (Excluding Ikamvanites) 2014 Matric Results

	Mean	Std. Dev.	Observations
English FAL	50.26	13.11	5074
Mathematics	32.53	20.38	2757
Mathematical Literacy	43.34	16.93	4425
Physical Science	34.68	17.46	2173
Life Sciences	40.67	18.37	3643

Table A1.3: All Learners 2014 Matric Results

	Mean	Std. Dev.	Observations
English FAL	48.45	13.75	297 065
Mathematics	33.09	21.36	167 098
Mathematical Literacy	44.31	17.36	225 954
Physical Science	36.43	19.06	117 902
Life Sciences	41.39	18.58	201 973

Figure A1.1: English

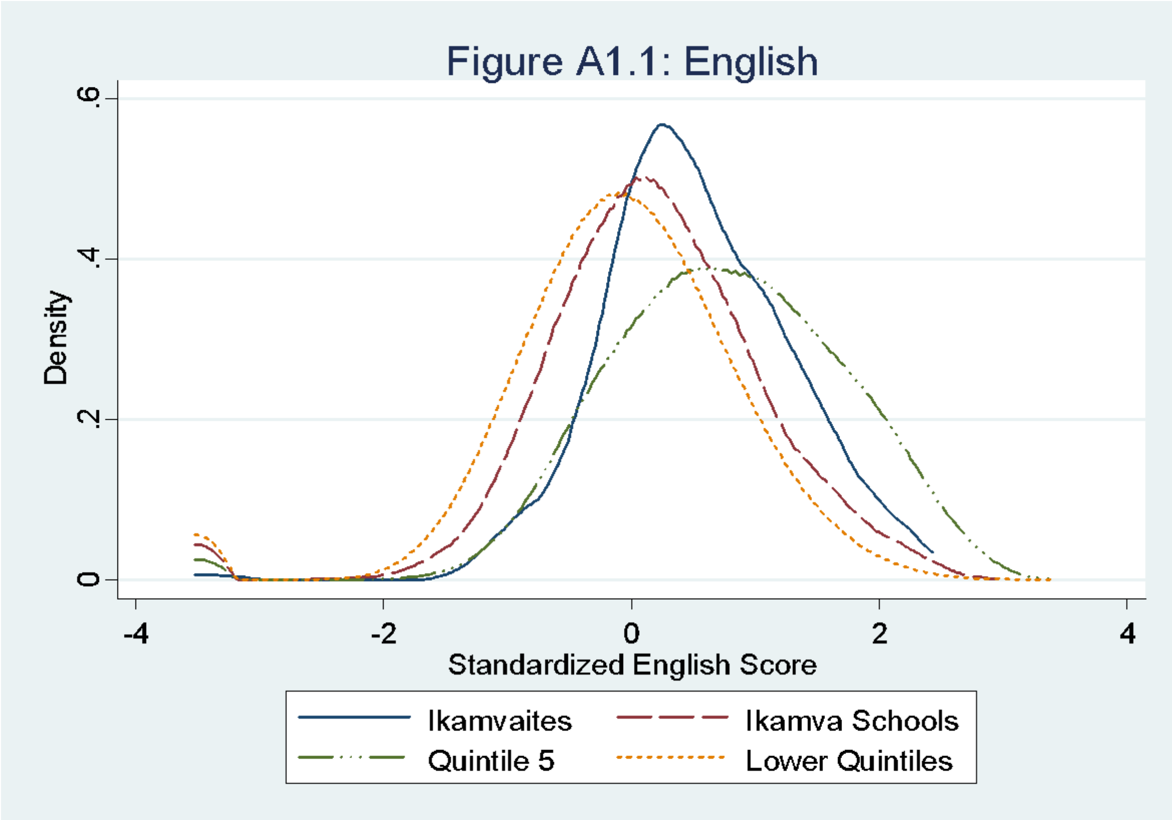


Figure A1.2: Mathematics

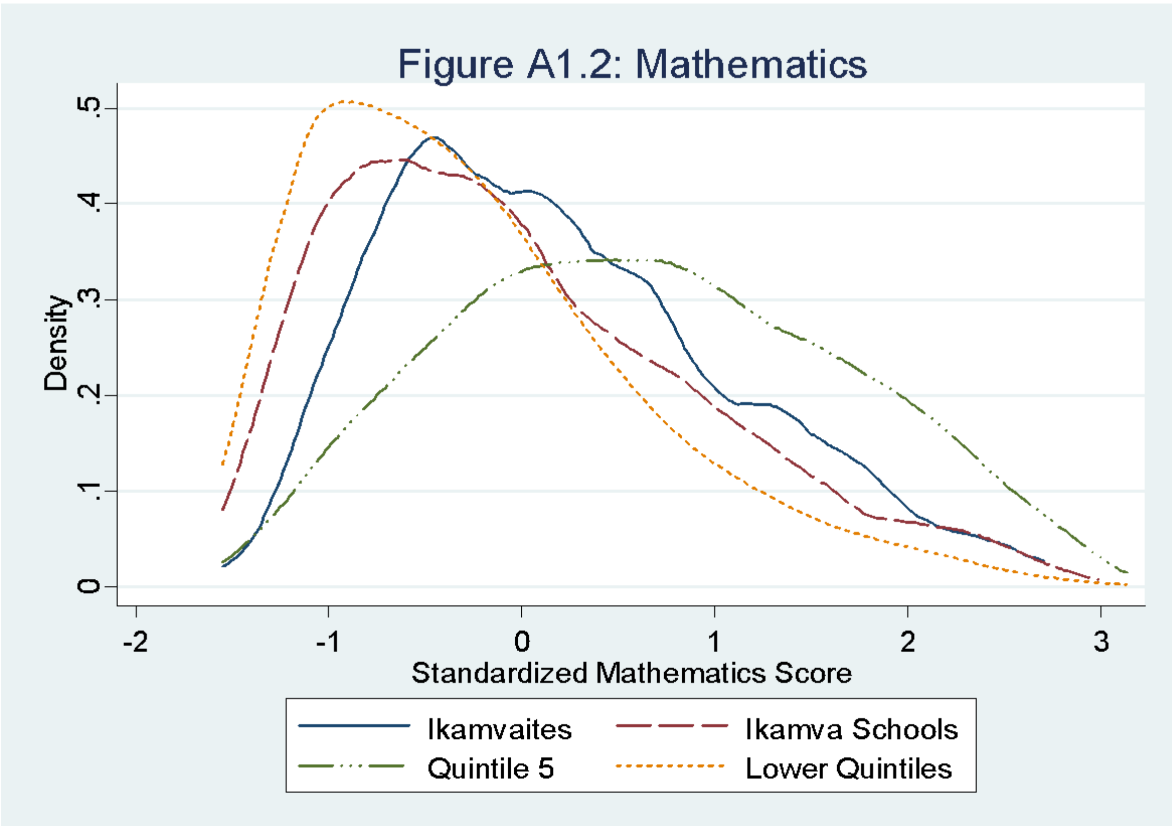


Figure A1.3: Mathematical Literacy

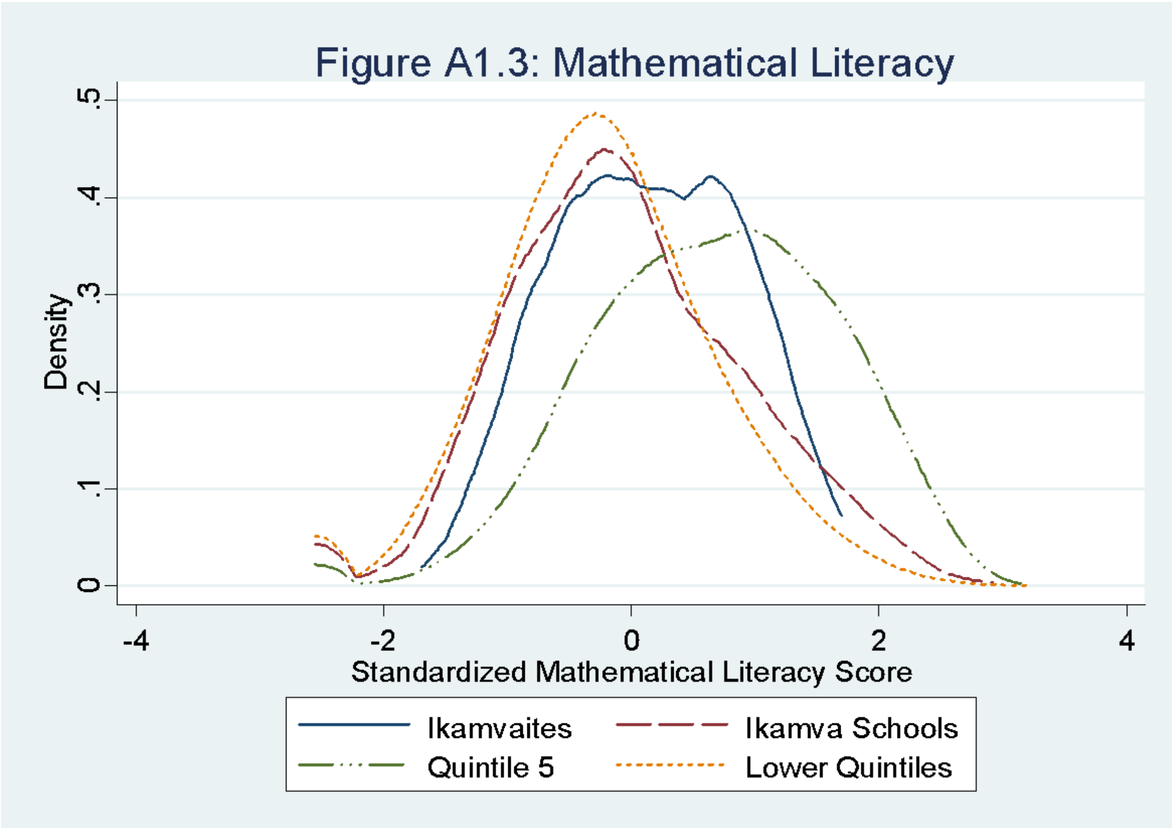


Figure A1.4: Physical Sciences

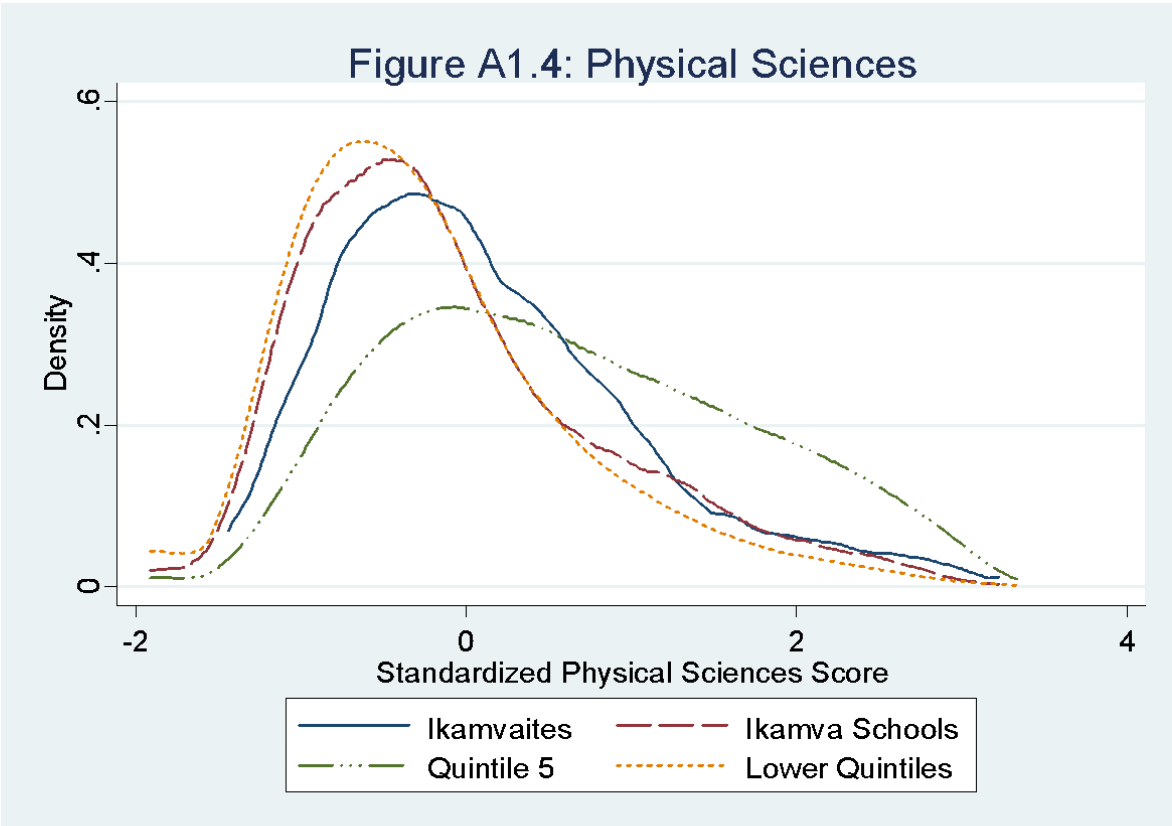
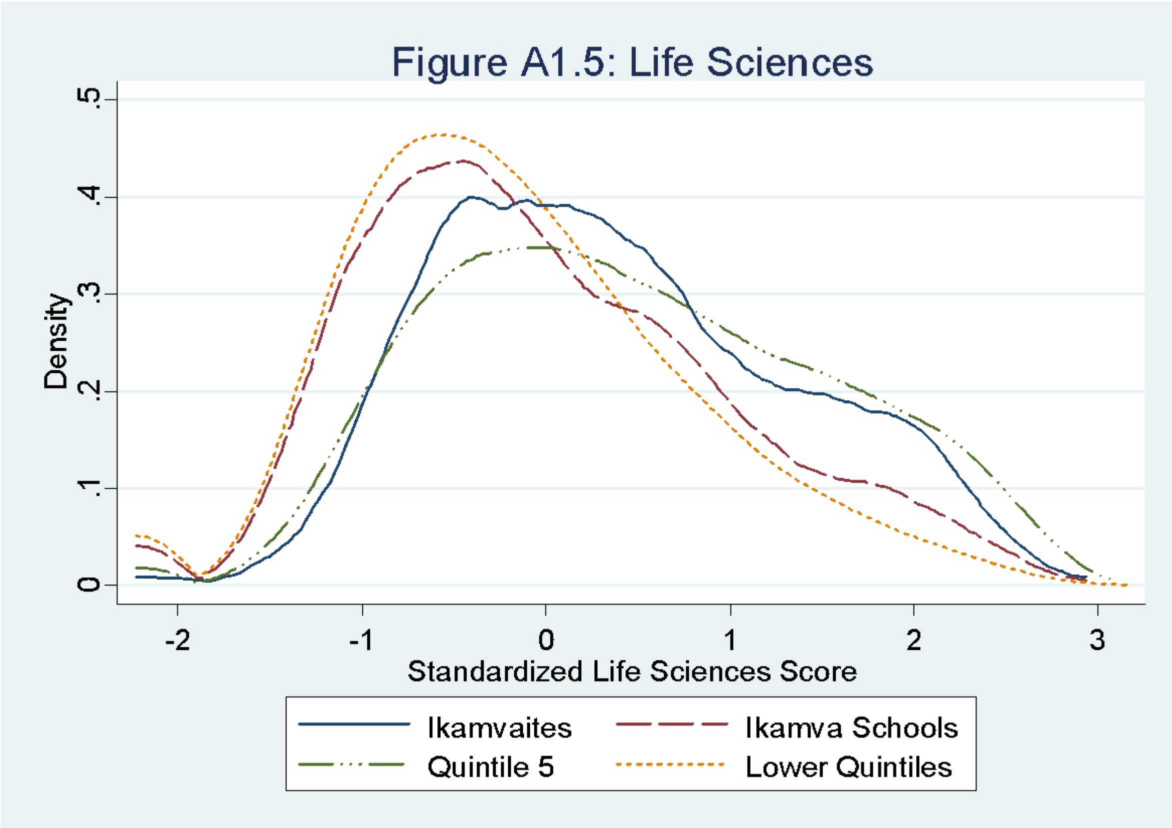


Figure A1.5: Life Sciences



A2: Regression Outputs

Table A2.1: Ikamvanites, Excluding Feeder Schools Dummy[4]

	A2.1.1	A2.1.2	A2.1.3	A2.1.4	A2.1.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	0.502***	0.264***	0.329***	0.258***	0.464***
	(0.0645)	(0.0686)	(0.0889)	(0.0806)	(0.0749)
Observations	297 065	167 097	225 954	117 901	201 973
R-squared	0.161	0.279	0.297	0.212	0.138

Table A2.2: Ikamva Schools, Excluding Ikamvanite Dummy

	A2.2.1	A2.2.2	A2.2.3	A2.2.4	A2.2.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamva Schools	0.160***	-0.0237	-0.0143	-0.0454**	-0.0259*
	(0.0131)	(0.0161)	(0.0129)	(0.0191)	(0.0155)
Observations	297 065	167 097	225 954	117 901	201 973
R-squared	0.161	0.279	0.297	0.212	0.137

Table A2.3: Ikamvanites, Controlling for Ikamva Schools

	A2.3.1	A2.3.2	A2.3.3	A2.3.4	A2.3.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	0.364***	0.301***	0.350***	0.317***	0.508***
	(0.0657)	(0.0703)	(0.0898)	(0.0826)	(0.0764)
Ikamva Schools	0.146***	-0.0393**	-0.0214	-0.0620***	-0.0465***
	(0.0133)	(0.0165)	(0.0130)	(0.0196)	(0.0158)
Observations	297 065	167 097	225 954	117 901	201 973
R-squared	0.161	0.279	0.297	0.212	0.138

[4] Each coefficient's standard error is stated in parentheses below the relevant coefficient estimate; statistical significance at the one, five and ten percent levels is denoted respectively by ***, **, and *.

Appendix B: Unmatched, All Provinces, Excluding Quintile 5

B1: Descriptive Statistics

Table B1.1: Ikamvanites 2014 Matric Results			
	Mean	Std. Dev.	Observations
English FAL	55.52	10.84	186
Mathematics	37.53	19.40	139
Mathematical Literacy	46.65	13.53	74
Physical Science	38.53	17.48	112
Life Sciences	48.15	18.10	138

Table B1.2: Ikamva Feeder Schools (Excluding Ikamvanites) 2014 Matric Results			
	Mean	Std. Dev.	Observations
English FAL	50.17	13.11	4910
Mathematics	29.42	19.37	2255
Mathematical Literacy	39.38	15.00	3489
Physical Science	32.99	16.69	1768
Life Sciences	38.18	17.75	2795

Table B1.3: All Learners 2014 Matric Results			
	Mean	Std. Dev.	Observations
English FAL	47.37	13.28	268196
Mathematics	28.90	19.36	128336
Mathematical Literacy	41.12	15.97	177557
Physical Science	33.14	17.20	91732
Life Sciences	39.13	17.61	159347

Figure B1.1: English

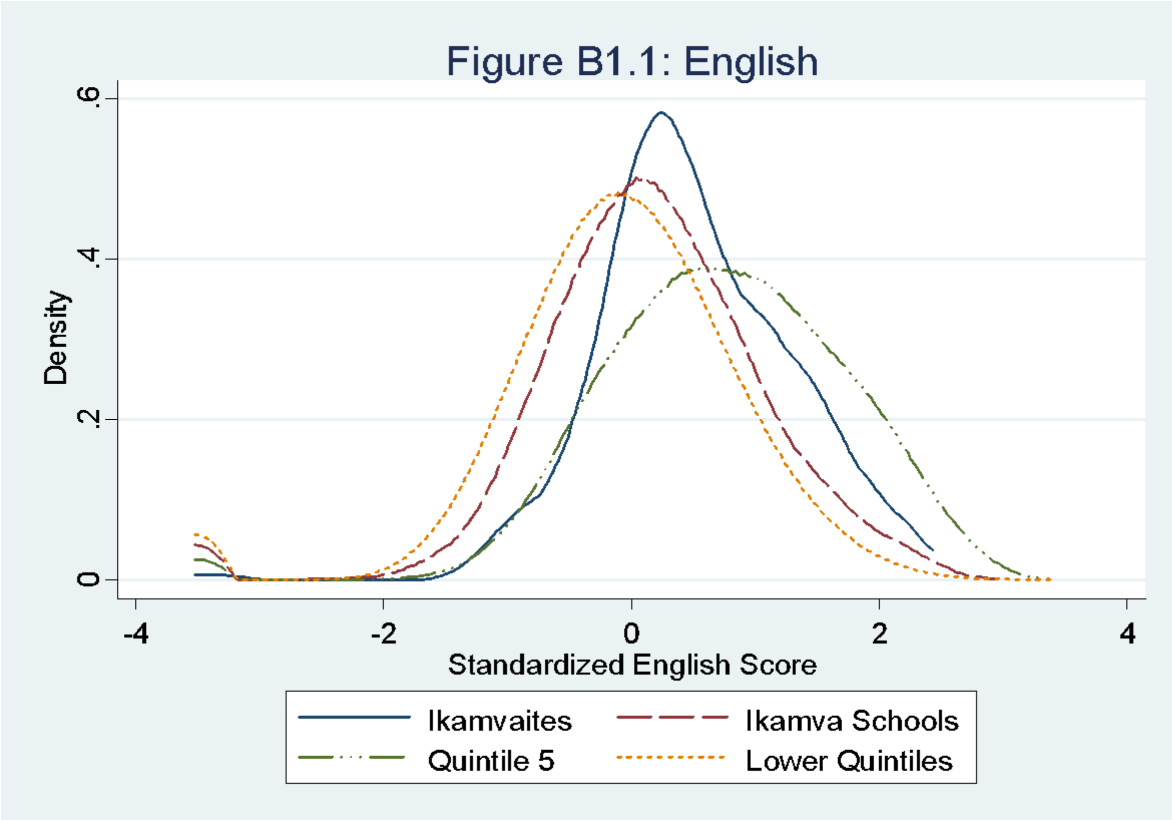


Figure B1.2: Mathematics

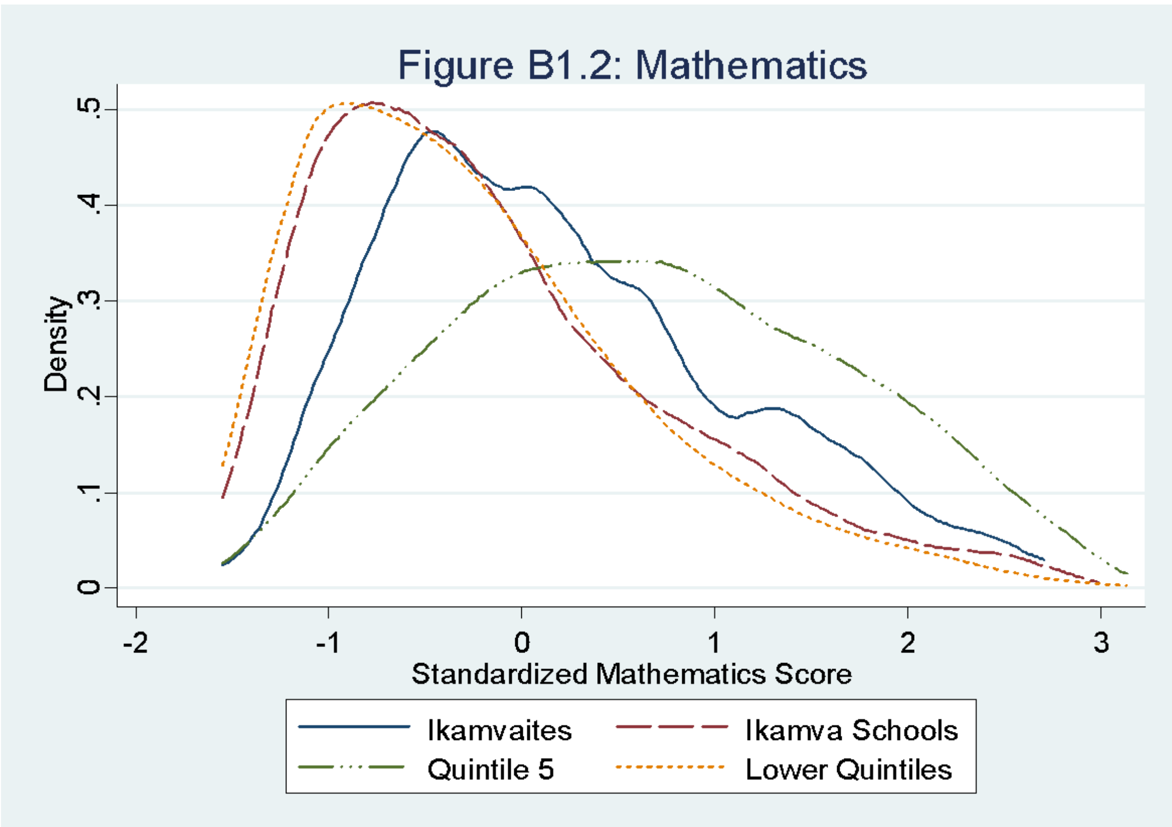


Figure B1.3: Mathematical Literacy

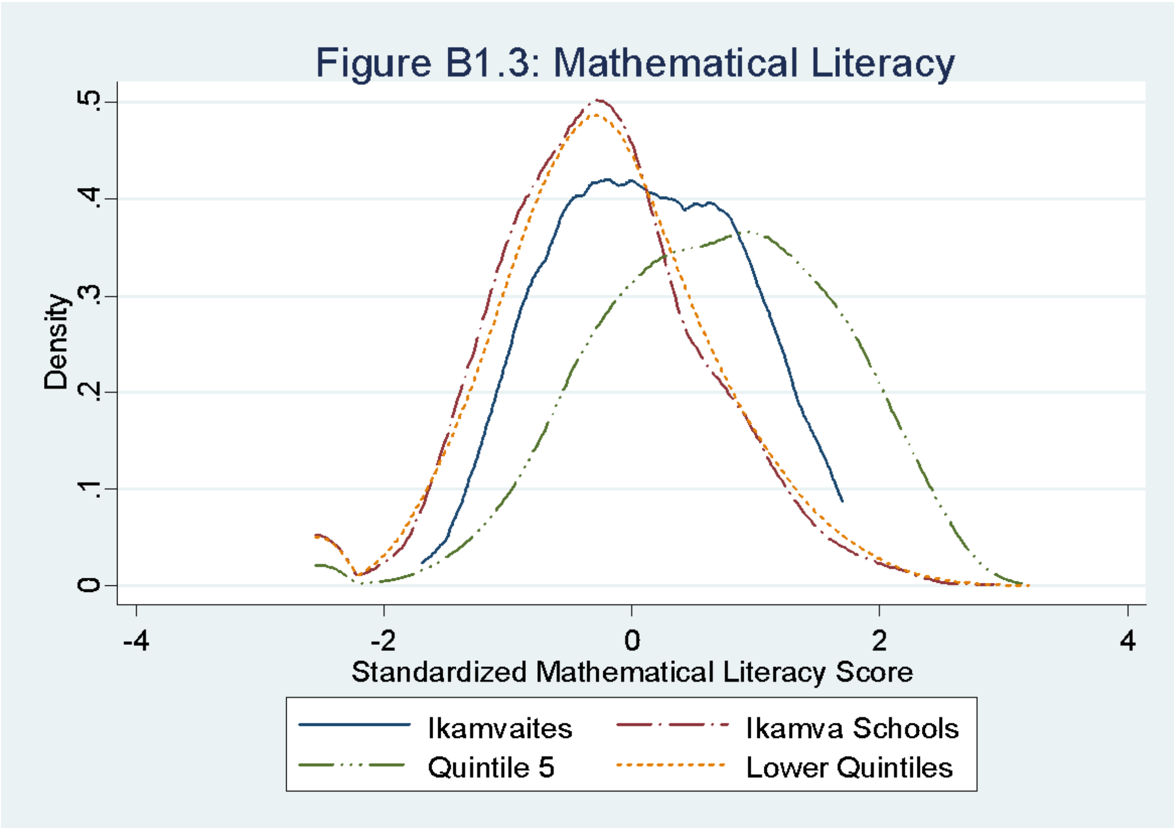


Figure B1.4: Physical Sciences

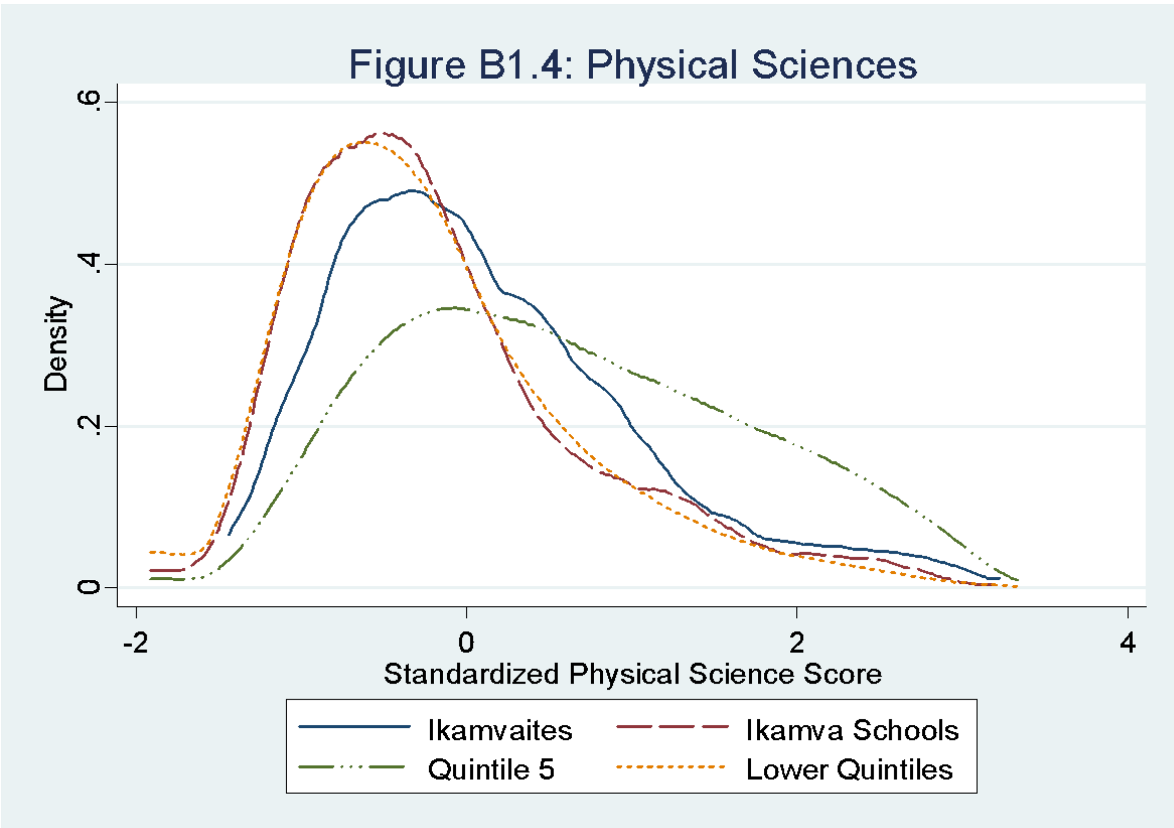
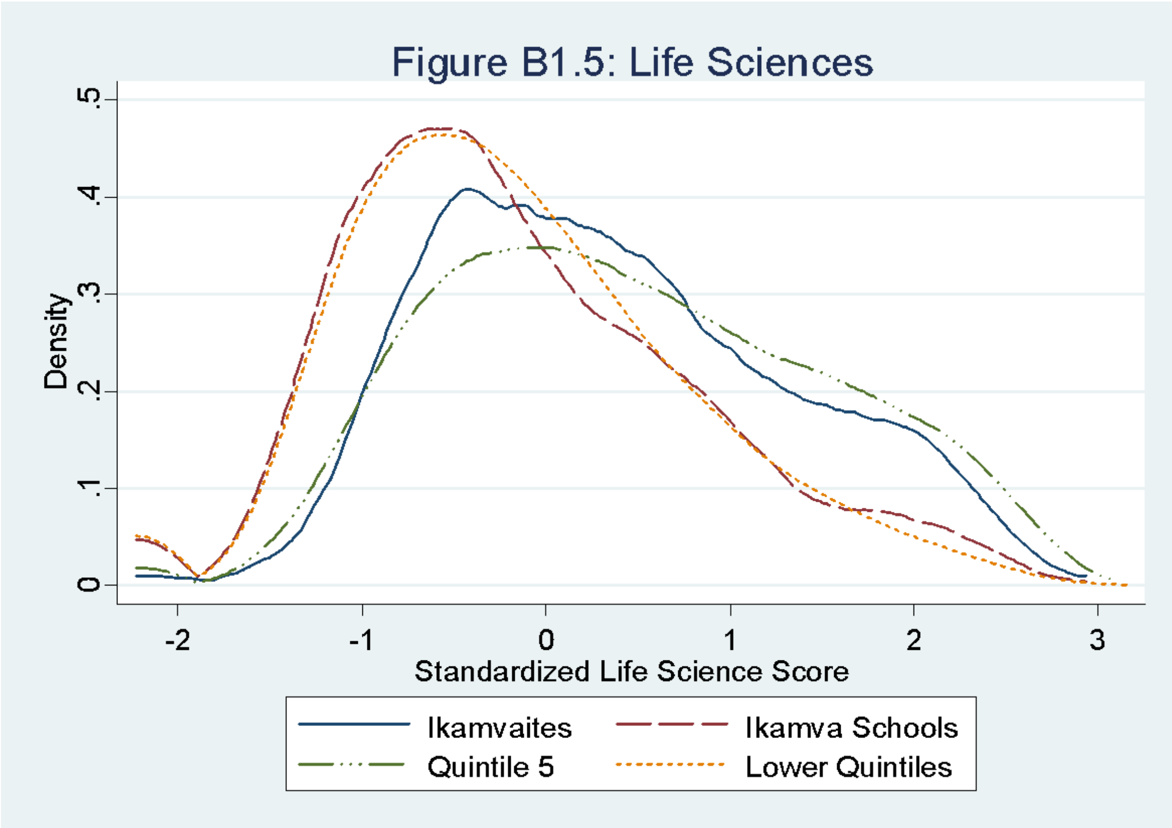


Figure B1.5: Life Sciences



B2: Regression Outputs

Table B2.1: Ikamvanites, Excluding Feeder Schools Dummy					
	B2.1.1	B2.1.2	B2.1.3	B2.1.4	B2.1.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	0.521***	0.300***	0.368***	0.302***	0.508***
	(0.0670)	(0.0696)	(0.0955)	(0.0793)	(0.0770)
Observations	259 094	117 550	164 958	84 025	147 324
R-squared	0.093	0.116	0.149	0.061	0.043

Table B2.2: Ikamva Schools, Excluding Ikamvanite Dummy					
	B2.2.1	B2.2.2	B2.2.3	B2.2.4	B2.2.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamva Schools	0.192***	-0.0146	-0.0191	0.0281	0.00758
	(0.0135)	(0.0176)	(0.0147)	(0.0204)	(0.0177)
Observations	259 094	117 550	164 958	84 025	147 324
R-squared	0.093	0.116	0.149	0.061	0.043

Table B2.3: Ikamvanites, Controlling for Ikamva Schools					
	B2.3.1	B2.3.2	B2.3.3	B2.3.4	B2.3.5
	English FAL	*Mathematics*	*Math. Lit.*	*Physics*	*Life Sci.*
Ikamvanite	0.355***	0.332***	0.395***	0.293***	0.525***
	(0.0682)	(0.0716)	(0.0965)	(0.0817)	(0.0788)
Ikamva Schools	0.178***	-0.0343*	-0.0280*	0.0100	-0.0182
	(0.0138)	(0.0181)	(0.0148)	(0.0210)	(0.0181)
Observations	259 094	117 550	164 958	84 025	147 324
R-squared	0.094	0.116	0.149	0.061	0.043

Appendix C: Matched, Western Cape

C1: Descriptive Statistics, Matric Performance

Table C1.1: Western Cape Ikamvanites			
Full Sample	Mean	Std. Dev.	Observations
English FAL	52.38	9.11	58
Mathematics	35.48	15.43	48
Mathematical Literacy	44.59	13.51	17
Physical Science	36.31	13.69	39
Life Sciences	47.42	15.31	48
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	52.65	8.74	34
Mathematics	33.68	15.84	31
Mathematical Literacy	50	13.95	7
Physical Science	33.85	14.64	26
Life Sciences	47	14.15	30

Table C1.2: Western Cape Ikamva Feeder Schools			
Full Sample	Mean	Std. Dev.	Observations
English FAL	45.81	12.42	1944
Mathematics	37.02	20.12	775
Mathematical Literacy	43.56	17.89	1983
Physical Science	34.60	17.94	719
Life Sciences	39.96	18.94	1506
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	49.59	10.67	767
Mathematics	40.27	19.87	507
Mathematical Literacy	50.92	17.54	859
Physical Science	37.35	18.17	454
Life Sciences	45.94	18.50	772

Table C1.3: All Western Cape Learners			
Full Sample	Mean	Std. Dev.	Observations
English FAL	50.78	14.00	30171
Mathematics	46.07	22.87	15375
Mathematical Literacy	47.99	18.25	33436
Physical Science	44.09	22.22	11191
Life Sciences	43.43	20.48	24837
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	55.40	13.11	17024
Mathematics	48.24	22.41	11815
Mathematical Literacy	53.69	17.21	18443
Physical Science	46.59	21.93	8340
Life Sciences	48.29	19.93	15973

C2: Descriptive Statistics, Systemic Performance

Table C2.1: Systemic Performance			
Ikamvanites	Mean	Std. Dev.	Observations
Systemic Language	42.31	13.05	38
Systemic Mathematics	21.40	8.17	38
Ikamva Schools	Mean	Std. Dev.	Observations
Systemic Language	53.31	19.40	1366
Systemic Mathematics	28.75	17.99	1366
WC All Schools	Mean	Std. Dev.	Observations
Systemic Language	60.16	19.12	30258
Systemic Mathematics	36.55	21.37	30258

C3: Regression Outputs

Table C3.1: English FAL

	C3.1.1	C3.1.2	C3.1.3	C3.1.4
Ikamvanite	0.225	0.210*	0.213	0.196
	(0.148)	(0.124)	(0.150)	(0.126)
Language SYS		0.368***		0.368***
		(0.00937)		(0.00937)
Mathematics SYS		0.391***		0.391***
		(0.0106)		(0.0106)
Ikamva Schools			0.0156	0.0189
			(0.0359)	(0.0300)
Observations	17 024	17 024	17 024	17 024
R-squared	0.266	0.487	0.266	0.487

Table C3.2: Mathematics

	C3.2.1	C3.2.2	C3.2.3	C3.2.4
Ikamvanite	0.0412	0.121	0.0522	0.119
	(0.151)	(0.123)	(0.154)	(0.126)
Language SYS		-0.141***		-0.141***
		(0.0100)		(0.0100)
Mathematics SYS		0.689***		0.689***
		(0.0102)		(0.0102)
Ikamva Schools			-0.0139	0.00195.3
			(0.0395)	(0.0322)
Observations	11 815	11 815	11 815	11 815
R-squared	0.309	0.541	0.309	0.541

Table C3.3: Mathematical Literacy

	C3.3.1	C3.3.2	C3.3.3	C3.3.4
Ikamvanite	0.403	0.549**	0.321	0.459*
	(0.308)	(0.259)	(0.308)	(0.260)
Language SYS		0.0860***		0.0857***
		(0.00797)		(0.00797)
Mathematics SYS		0.745***		0.746***
		(0.0119)		(0.0119)
Ikamva Schools			0.108***	0.118***
			(0.0306)	(0.0258)
Observations	18 443	18 443	18 443	18 443
R-squared	0.340	0.531	0.341	0.531

Table C3.4: Physical Sciences				
	C3.4.1	C3.4.2	C3.4.3	C3.4.4
Ikamvanite	-0.000510	0.0506	0.0912	0.116
	(0.167)	(0.142)	(0.170)	(0.145)
Language SYS		-0.0612***		-0.0621***
		(0.0128)		(0.0128)
Mathematics SYS		0.596***		0.597***
		(0.0128)		(0.0128)
Ikamva Schools			-0.114***	-0.0812**
			(0.0428)	(0.0364)
Observations	8 340	8 340	8 340	8 340
R-squared	0.293	0.490	0.293	0.490

Table C3.5: Life Sciences				
	C3.5.1	C3.5.2	C3.5.3	C3.5.4
Ikamvanite	0.244	0.275**	0.244	0.212
	(0.159)	(0.128)	(0.161)	(0.129)
Language SYS		0.0626***		0.0630***
		(0.00860)		(0.00860)
Mathematics SYS		0.610***		0.610***
		(0.00911)		(0.00911)
Ikamva Schools			-0.000545	0.0805***
			(0.0341)	(0.0274)
Observations	15 973	15 973	15 973	15 973
R-squared	0.254	0.520	0.254	0.520

Appendix D: Matched, Western Cape, Excluding Quintile 5

D1: Descriptive Statistics, Matric Results

Table D1.1: Western Cape Ikamvanites			
Full Sample	Mean	Std. Dev.	Observations
English FAL	52.38	9.11	58
Mathematics	34.96	15.83	44
Mathematical Literacy	42.2	12.51	15
Physical Science	35.35	13.40	37
Life Sciences	46.85	15.16	46
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	52.65	8.74	34
Mathematics	33.31	16.25	29
Mathematical Literacy	48	14.14	6
Physical Science	33.04	14.34	25
Life Sciences	47	14.15	30

Table D1.2: Western Cape Ikamva Feeder Schools			
Full Sample	Mean	Std. Dev.	Observations
English FAL	45.72	12.39	1932
Mathematics	28.95	16.79	468
Mathematical Literacy	37.41	14.63	1464
Physical Science	30.40	15.52	453
Life Sciences	34.77	17.20	978
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	49.45	10.65	757
Mathematics	30.77	16.68	243
Mathematical Literacy	41.96	13.53	514
Physical Science	32.72	15.53	228
Life Sciences	39.63	17.15	395

Table D1.3: All Western Cape Learners			
Full Sample	Mean	Std. Dev.	Observations
English FAL	47.51	12.51	22983
Mathematics	37.43	21.45	6254
Mathematical Literacy	42.56	16.18	21787
Physical Science	35.89	20.13	5129
Life Sciences	37.22	18.38	13288
Reduced Sample	Mean	Std. Dev.	Observations
English FAL	51.32	11.61	11300
Mathematics	38.41	20.67	3765
Mathematical Literacy	47.11	15.09	10146
Physical Science	37.34	19.73	3000
Life Sciences	41.19	18.09	6769

D2: Descriptive Statistics, Systemic Performance

Table D2.1: Systemic Performance			
Ikamvanites	Mean	Std. Dev.	Observations
Systemic Language	41.34	12.99	35
Systemic Mathematics	20.91	8.18	35
Ikamva Schools	Mean	Std. Dev.	Observations
Systemic Language	41.71	12.74	757
Systemic Mathematics	18.77	8.23	757
WC All Schools	Mean	Std. Dev.	Observations
Systemic Language	51.61	16.55	13911
Systemic Mathematics	26.20	15.15	13911

D3: Regression Outputs

Table D3.1: English FAL

	D3.1.1	D3.1.2	D3.1.3	D3.1.4
Ikamvanite	0.222	0.211*	0.213	0.197
	(0.150)	(0.125)	(0.152)	(0.127)
Language SYS		0.469***		0.468***
		(0.0119)		(0.0119)
Mathematics SYS		0.458***		0.458***
		(0.0163)		(0.0163)
Ikamva Schools			0.0120	0.0179
			(0.0367)	(0.0305)
Observations	11 300	11 300	11 300	11 300
R-squared	0.042	0.337	0.042	0.337

Table D3.2: Mathematics

	D3.2.1	D3.2.2	D3.2.3	D3.2.4
Ikamvanite	0.0250	0.103	0.120	0.158
	(0.148)	(0.125)	(0.154)	(0.130)
Language SYS		-0.0391**		-0.0395**
		(0.0178)		(0.0178)
Mathematics SYS		0.650***		0.649***
		(0.0198)		(0.0198)
Ikamva Schools			-0.124**	-0.0717
			(0.0570)	(0.0483)
Observations	3 765	3 765	3 765	3 765
R-squared	0.278	0.484	0.279	0.484

Table D3.3: Mathematical Literacy

	D3.3.1	D3.3.2	D3.3.3	D3.3.4
Ikamvanite	0.398	0.545*	0.336	0.494*
	(0.332)	(0.283)	(0.333)	(0.284)
Language SYS		0.156***		0.156***
		(0.0116)		(0.0116)
Mathematics SYS		0.867***		0.868***
		(0.0196)		(0.0196)
Ikamva Schools			0.0861**	0.0701*
			(0.0421)	(0.0358)
Observations	10 146	10 146	10 146	10 146
R-squared	0.145	0.380	0.145	0.380

Table D3.4: Physical Sciences				
	D3.4.1	D3.4.2	D3.4.3	D3.4.4
Ikamvanite	-0.00885	0.0441	0.0253	0.0356
	(0.157)	(0.134)	(0.164)	(0.140)
Language SYS		0.0749***		0.0750***
		(0.0202)		(0.0202)
Mathematics SYS		0.572***		0.572***
		(0.0229)		(0.0229)
Ikamva Schools			-0.0434	0.0109
			(0.0587)	(0.0503)
Observations	3 000	3 000	3 000	3 000
R-squared	0.261	0.459	0.262	0.459

Table D3.5: Life Sciences				
	D3.5.1	D3.5.2	D3.5.3	D3.5.4
Ikamvanite	0.258*	0.258**	0.358**	0.300**
	(0.151)	(0.125)	(0.155)	(0.129)
Language SYS		0.179***		0.179***
		(0.0135)		(0.0135)
Mathematics SYS		0.599***		0.598***
		(0.0168)		(0.0168)
Ikamva Schools			-0.131***	-0.0545
			(0.0487)	(0.0404)
Observations	6 769	6 769	6 769	6 769
R-squared	0.191	0.443	0.191	0.443

Appendix E: Restricted and Unrestricted Western Cape Sample Estimates, Including Quintile Five Schools

E1.1: English FAL

	E1.1.1 WC Full	E1.1.2 WC Matched	E1.1.3 WC Full	E1.1.4 WC Matched
Ikamvanite	0.488***	0.225	0.471***	0.213
	(0.116)	(0.148)	(0.117)	(0.150)
Ikamva Schools			0.0213	0.0156
			(0.0228)	(0.0359)
Observations	30 171	17 024	30 171	17 024
R-squared	0.255	0.266	0.255	0.266

E1.2: Mathematics

	E1.2.1 WC Full	E1.2.2 WC Matched	E1.2.3 WC Full	E1.2.4 WC Matched
Ikamvanite	0.193	0.0412	0.209	0.0522
	(0.128)	(0.151)	(0.131)	(0.154)
Ikamva Schools			-0.0214	-0.0139
			(0.0342)	(0.0395)
Observations	15 375	11 815	15 375	11 815
R-squared	0.326	0.309	0.326	0.309

E1.3: Mathematical Literacy

	E1.3.1 WC Full	E1.3.2 WC Matched	E1.3.3 WC Full	E1.3.4 WC Matched
Ikamvanite	0.332	0.403	0.288	0.321
	(0.208)	(0.308)	(0.209)	(0.308)
Ikamva Schools			0.0549***	0.108***
			(0.0213)	(0.0306)
Observations	33 436	18 443	33 436	18 443
R-squared	0.337	0.340	0.337	0.341

E1.4: Physical Sciences				
	E1.4.1	E1.4.2	E1.4.3	E1.4.4
	WC Full	WC Matched	WC Full	WC Matched
Ikamvanite	0.273*	-0.000510	0.343**	0.0912
	(0.155)	(0.167)	(0.158)	(0.170)
Ikamva Schools			-0.0881**	0.114***
			(0.0392)	(0.0428)
Observations	11 191	8 340	11 191	8 340
R-squared	0.320	0.293	0.320	0.293

E1.5: Life Sciences				
	E1.5.1	E1.5.2	E1.5.3	E1.5.4
	WC Full	WC Matched	WC Full	WC Matched
Ikamvanite	0.566***	0.244	0.584***	0.244
	(0.135)	(0.159)	(0.137)	(0.161)
Ikamva Schools			-0.0220	0.000545
			(0.0264)	(0.0341)
Observations	24 837	15 973	24 837	15 973
R-squared	0.284	0.254	0.284	0.254

Appendix F: Restricted and Unrestricted Western Cape Sample Estimates, Excluding Quintile Five Schools

F1.1: English FAL				
	F1.1.1 WC Full	F1.1.2 WC Matched	F1.1.3 WC Full	F1.1.4 WC Matched
Ikamvanite	0.487*** (0.116)	0.222 (0.150)	0.471*** (0.117)	0.213 (0.152)
Ikamva Schools			0.0196 (0.0229)	0.0120 (0.0367)
Observations	22 498	11 300	22 498	11 300
R-squared	0.039	0.042	0.039	0.042

F1.2: Mathematics				
	F1.2.1 WC Full	F1.2.2 WC Matched	F1.2.3 WC Full	F1.2.4 WC Matched
Ikamvanite	0.197* (0.120)	0.0250 (0.148)	0.282** (0.124)	0.120 (0.154)
Ikamva Schools			-0.110*** (0.0412)	-0.124** (0.0570)
Observations	4 616	3 765	4 616	3 765
R-squared	0.047	0.278	0.048	0.279

F1.3: Mathematical Literacy				
	F1.3.1 WC Full	F1.3.2 WC Matched	F1.3.3 WC Full	F1.3.4 WC Matched
Ikamvanite	0.306 (0.217)	0.398 (0.332)	0.281 (0.218)	0.336 (0.333)
Ikamva Schools			0.0319 (0.0252)	0.0861** (0.0421)
Observations	20 530	10 146	20 530	10 146
R-squared	0.099	0.145	0.099	0.145

F1.4: Physical Sciences				
	F1.4.1	F1.4.2	F1.4.3	F1.4.4
	WC Full	WC Matched	WC Full	WC Matched
Ikamvanite	0.272**	-0.00885	0.265*	0.0253
	(0.138)	(0.157)	(0.142)	(0.164)
Ikamva Schools			0.00858	-0.0434
			(0.0443)	(0.0587)
Observations	3 982	3 000	3 982	3 000
R-squared	0.037	0.261	0.037	0.262

F1.5: Life Sciences				
	F1.5.1	F1.5.2	F1.5.3	F1.5.4
	WC Full	WC Matched	WC Full	WC Matched
Ikamvanite	0.583***	0.258*	0.643***	0.358**
	(0.127)	(0.151)	(0.129)	(0.155)
Ikamva Schools			-0.0763**	0.131***
			(0.0314)	(0.0487)
Observations	11 729	6 769	11 729	6 769
R-squared	0.025	0.191	0.025	0.191