Study on the Factors Affecting Scholastic Achievement of Grade 5 and Grade 9 in February 2015 - A Case of Chin State-

(Research Paper 20151021)

Prof. Dr. Hiromitsu Muta
Policy Advisor, Ministry of Education
The Republic of the Union of Myanmar

Summary

Nationwide educational examinations in Myanmar do not exist, with the exception of the matriculation examination at the end of Grade 11, which is also the entrance examination to higher education institutions. The usual examinations at the end of each term and the end of the school year are conducted at the school level, and the results are not comparable between schools to evaluate academic abilities. Against this background, a nationwide examination was conducted in February 2015 for Grade 5 and Grade 9 students under the Ministry of Education. Some students from monastic schools also participated in the examination. The examination questions were developed at the district level for Grade 5 and at the state/regional level for Grade 9. The purpose of these examinations was not to investigate current achievement levels, but to confirm if individual students had retained adequate knowledge and skills to graduate from primary and middle school levels. Students, who did not pass the examination, had to take supplementary classes and a supplementary examination to proceed to the next grade.

These examinations were not standardized to compare the results between regions or between different academic years. Information related to achievement results such as student motivation, family background, and study conditions was not collected. Therefore, the achievement examination in 2015 for Grade 5 and Grade 9 was not suited to analyzing the cause behind the achievement results. However, conducting a nationwide examination was a very rare event, and some useful information for future educational policy-making will be obtained through careful analyses.

According to the analysis of the data in Chin State, it was found that educational conditions such as “student/teacher ratio,” “quality of teachers,” and “number of students” can contribute to increasing the pass rate more significantly than the type of school or school ranking, which are considered to be proxy variables of student motivation and socio-economic status.

1. Purpose

Scholastic achievement is an important outcome of an educational system in any country, and governments expend a lot of effort to increase the achievement level. However, it is not always clear what kind of educational conditions or educational policies are appropriate to increase academic achievement levels because the situation differs according to country and region.

There have been many studies on factors contributing to improving students' achievement scores. The classical milestone of this kind of statistical analysis was done by Coleman et al., 1966 using large data samplings in the U.S. When factors contributing to achievement scores were classified according to school and family-related factors, they found that the influential factors were the family-related factors such as socio-economic status (hereinafter referred as SES). The following studies have confirmed these results and this finding has been commonly accepted in this field.

The World Bank conducted many studies in education in order to ascertain the effectiveness of investing money in schools. Heyneman & Loxley (1983) analyzed scholastic achievement scores and influencing factors in many countries including developing countries, and they found that school-related factors were more influential than family-related factors on scholastic achievements in low income countries. This finding was in contrast to the findings by Coleman, et al, 1966 using the data in the U.S. Their findings encouraged investment in education in developing countries.

Since then, international standardized achievement examinations have been widely conducted and similar studies have also been conducted. For many developing countries that became middle-income countries, the influence of family-related factors also became a major component (e.g. Baker et al., 2002). However, the findings of Heyneman and Loxley (1983) are still valid. Tomita & Muta (2010) re-examined the influence of school and family-related factors on scholastic achievements in Malawi, one of the very low-income countries, and confirmed Heyneman and Loxley's findings (1983) i.e., school-related factors are more influential and family-related factors are less influential on scholastic achievements in low-income countries (called the HL effect). Two different statistical methodologies were employed: 1) separate analyses of school and student level variables based on linear regression and structural equation modeling (SEM), and 2) simultaneous analyses of school and student level variables based on hierarchical linear modeling (HLM). Results from both methodologies confirmed the HL effect in the case of Malawi. It may also still be true in other countries. One interpretation of the HL effect may be that the variance of school-

related factors is larger than family-related factors in developing countries and vice versa. It still appears to be true that intervention in school education effectively contributes to higher achievement in some developing countries.

It is necessary to measure the status of scholastic achievement first in order to conduct a similar study in the Republic of the Union of Myanmar. There has been no nationwide examination in Myanmar, with the exception of the matriculation examination at the end of Grade 11, which also serves as the entrance examination to higher education institutions, and the average pass rate percentage has been in the 30's every year. The usual examinations at the end of terms and the end of the year are conducted at the school level; and the results are not comparable between schools.

Given this situation, a nationwide examination was conducted in February 2015 for Grade 5 and Grade 9 students by the Ministry of Education. The Grade 5 and Grade 9 are the last year of primary and middle school levels. Some students from monastic schools also participated in the examination. The examination questions were developed at the district level for Grade 5 and at the state/region level for Grade 9. The purpose of these examinations was not to investigate the current scholastic achievement level, but to confirm if individual students had retained adequate knowledge and skills to graduate from primary and middle school levels. Those, who did not pass the examination, had to take supplementary classes and a supplementary examination later to proceed to the next grade. The basic idea of this examination was to develop a graduation examination from primary school and middle school levels. All who passed these graduation examinations, were seen as equivalent to graduates even if they were actually out of school, and are able to proceed to the next grade.

It is popular in many countries to conduct a standardized examination nationwide to assess whether students acquired the knowledge and skills as expected under the national curriculum. If the achievement level is not satisfactory, the government has to find the reasons why and to find ways to improve the situation through needed educational policies such as improving educational conditions, changing curriculum, and enhancing the capacity development of teachers and relevant government officials. In such cases, the main purpose of the examination is to use the results for quality assurance purposes. But, this is still not the case in the Republic of the Union of Myanmar.

The examinations in February 2015 for Grade 5 were given for core subjects such as Myanmar language, English, mathematics, science, and social studies, and the test was one hour and half for each subject. For Grade 9, the examination was given in six core subjects

such as Myanmar language, English, mathematics, science, history, and geography were tested; the test was two hours for each subject. The examinations were conducted in the second week of February, one subject per day. Although the students had an opportunity to take a practice test in December 2014, it was their first time to take such a lengthy examination. The results were marked at 20 point intervals as "A", "B", "C", "D", and a "D" that was less than 40 points was defined as a fail. Students who received a "D" in any subject had to take supplementary classes for two weeks in April and take the supplementary examination between May 14 and 16. The supplementary classes and examination were conducted only for the subject the students had failed.

The examination questions in 2015 were not standardized to allow a comparison of the test results between regions or different years. Information that may be related to achievement results such as student motivations, family background, and study conditions was not collected. In that sense, the achievement examination in 2015 for Grade 5 and Grade 9 may not be greatly suited to analyzing the reasons behind the achievement results. However, as an examination conducted nationwide, it was a very rare event; and it may be possible to obtain useful information for educational policymaking in future through careful analyses.

2. Method

The currently available data on the examination is the registered number of students, number of students who took the examination, the number of students who passed all of the subjects for Grade 5 and Grade 9 by school. The pass rate is easily calculated by dividing the number of students who passed by the number of students who took examination. The pass rate was calculated for all the schools and a dataset was constructed (hereafter referred as “Pass Rate Dataset”). This dataset included a few monastic schools that participated in the examination.

The average figures of the initial pass rate by state/region ranged from 49.50% to 96.03; and the national average was 75.35% for Grade 5. From the standpoint of examination content and ways of marking the examination, the difference between districts and states/regions may be due to a difference in difficulty rather than a difference in student abilities. In terms of the socio-economic index, it was expected that the achievement results would be higher in the wealthier states/regions such as Yangon and Mandalay, but in actuality, they ranked in the middle for all states/regions. The average figures for the final pass rate by state/region ranged from 87.05% to 97.70%, and the national average was 94.16%.

For Grade 9, the average figures for the initial pass rate by state/region ranged from 21.81% to 85.60%, and the national average was 51.60%. The average figures for the final pass rate by state/region ranged from 83.20% to 95.52%, and the national average was 88.91%.

If the average pass rate is extremely high or low, it is very difficult to analyze factors affecting the pass rate because the variance is too small. If everybody passes or fails, none of the factors can be identified as an important contributor to the result. Thus, data that can be used for analysis may be the data of some of the states/regions where the initial pass rates for Grade 5 or Grade 9 were moderate. Although a standard for examination questions was not set and a nationwide analysis is not feasible, this kind of data is still valuable as pointers for educational policies in future.

In contrast, some variables related to school are obtainable from individual school data such as address, type of school, school ranking or grade, number of students, number of teachers by qualification, etc. These variables are obtainable from the dataset as of October 2014 (Muta 2015b), (hereinafter referred as "School Basic Dataset"). If the Pass Rate Dataset and the School Basic Dataset are combined, it becomes possible to analyze the school conditions that contribute to the pass rate. To merge both datasets, it is important to have the same variable. The merging is easy if both datasets have a unified school code that does not change. However, in actuality, there is no such a code, only the name of the school. It is very difficult to merge two datasets based on the name of a school because the names in the two datasets sometimes differ slightly and they cannot be merged automatically. If one name includes "-" which is equivalent to "(" in the other dataset systematically, it is possible to replace "-" to "(". Most cases are rather complex. For example, one name may be the abbreviation of another name, or the basic characters are the same, but the tonal symbols are slightly different. Finally, all the names are confirmed by visual inspection after sorting the names in the same order in both datasets. It was time consuming preparative work for analysis. That is why Chin State alone was selected for this trial analysis because the pass rates were moderate and the number of schools was not very large.

A dataset for further analysis, the Combined Dataset, was obtained by merging the two datasets, Pass Rate Dataset and School Basic Dataset. A few monastic schools were included in the Pass Rate Dataset, but not in the School Basic Dataset. A few schools in the Pass Rate Dataset could not be identified in the School Basic Dataset. After cleaning and merging the two datasets, the Combined Dataset for further analyses was obtained and the results for the reduced number of schools and students are shown in Table 1. Since all of the schools that had a Grade 9 were included in the schools that had a Grade 5, the total number of schools was 1,233.

Table 1 Result of the Combined Data

Item / Grade	Pass Rate Data set		Combined Data set		% of combined		Pass Rate	
	School	Student	School	Student	School	Student	Initial	Final
G5	1,266	12,041	1,233	11,770	97.39%	97.75%	52.43%	87.05%
G9	220	7,580	219	7,545	99.55%	99.54%	26.62%	91.67%

3. Analysis

3.1 Consistency of Data between the Two Datasets

The number of registered students in Grade 5 and Grade 9 are included in both the Pass Rate Dataset and School Basic Dataset. The difference was in the timing when the data was taken, which was 3 and a half months. If students moved from one school to another, dropped out, and moved in from another state/region or moved out to another state/region, the number may be different. Table 2 shows the difference in the number of students at each school between the two the datasets. For example, the number of students increased in some schools and decreased in others, but in summary, the total number of students in Grade 5 decreased from 12,116 to 11,770 (2.86%), and the total number of students in Grade 9 decreased from 7,928 to 7,545 (4.83%). This amount of moving in and moving out that was observed toward the end of academic year in Grade 5 and Grade 9 appears to be normal (Muta 2014a), and there was no strange inconsistency between the two datasets.

Table 2 Difference in the Number of Students between Two Datasets

Increase/ decrease		Decrease			Same	Increase			Total
		21−	11−20	1−10	0	1−10	11−20	21−	
G5	Numbe of schools	4	10	308	704	199	7	1	1233
	Number of students	−124	−135	−760	0	542	93	38	−346
G9	Numbe of schools	10	13	102	41	42	8	3	219
	Number of students	−332	−185	−308	0	154	115	173	−383

3.2 Factors Affecting the Pass Rates of Grade 5 and Grade 9

(1) Variables on Type of School and Location

As mentioned earlier, family-related factors such as the SES of families and study motivation of students are important variables that explain the overall academic achievement of students. These variables are usually obtained through student questionnaires. In this study, such data were not available and the only available variables were schools that were somewhat related. However, the following variables can be used as proxies of family-related

variables.

One variable is the type of school. The basic education schools under the Ministry of Education in the Republic of the Union of Myanmar are classified as High School, Branch High School, Middle School, Branch Middle School, Post Primary School, Primary School, and Branch Primary School based on the highest class grade and the number of students. “Branch” means “less than standard scale” in this case. In general, a High School includes middle school and primary school level classes; and a Middle School includes primary school level classes. If a student is motivated to study to the high school level, it is convenient to enroll in a High School even from a primary school level. Of course, there are cases where the neighboring school happens to be a High School or Middle School, but not a Primary School. However, from previous studies (Muta 2014b), a motivated student tends to transfer from the neighboring Primary School to Middle School or High School whenever it becomes possible to commute to a higher level school. In this sense, those who are registered in High Schools are more motivated than those registered in Middle Schools, and those registered in Middle Schools are more motivated than those registered in Primary Schools for Grade 5 and Grade 9 in general.

Another variable is the school ranking or grade. School ranking is classified as "A", "B", "C", "D", and "E" based on the accessibility from the Township Education Office. For example, School Rank "A" means the school is located within a traveling distance of one hour from the Township Education Office and it is usually located in the central part of the township. In contrast, School Rank "E" means the school is located in a remote area and it may take more than one day to get to from the Township Education Office. Families living within the center of a Township are generally wealthier than families living in remote areas. That is why the variable of school ranking has a strong correlation with the economic condition of the family (World Bank 2015). Thus, this can be a good proxy variable of student SES.

Using the same logic, a district may have some influence on student SES. But, for the Grade 5 examination, the district must have had a strong impact on achievement examination results because the examination questions were made and marked by the district. Since the examination questions and the marking method depend on the district, it is important to consider its influence especially for Grade 5.

(2) Variables on Educational Conditions

One condition that must have influenced scholastic achievement is the number of students

per teacher (S/T ratio). It is generally believed that the smaller the S/T ratio is, the better the achievement score (Glass G.V. and Smith M.L 1979). As the purpose of this research was to explain the impact on the Pass Rate for Grade 5 and Grade 9, the S/T ratio based on the number of teachers and students specific to Grade 5 and Grade 9 should have been calculated; however, the data on teachers was not available by class grade. As a result, the S/T ratios at the primary school and middle school levels were used as the S/T ratios for Grade 5 and Grade 9.

The quality of teachers was also important (Muta 2015a, 2015b). Information on teacher rank and level were available only for the primary school level. These were the principals, middle school level teachers who taught the primary school, primary school teachers whose salary scale was the same as middle school teachers, primary school teachers, and daily wage temporary teachers. Teacher rank and level depended on qualifications, experience, and performance. As there was no data on the rank and level specific to Grade 5 teachers, the average rank and level of the school as a whole was used instead. Specifically, the ratio of teachers whose salary scale was the same as middle school teachers or above among the total number of teachers at the primary school level was used as the variable for teacher quality.

The student size may also be an influential factor on achievement results. Generally, school or class management is easier if the number of students is small because a teacher can take very good care of the students. In contrast, there may be an optimal size for students. If the number of students is too small, they cannot cooperate or compete with each other. Certain numbers of students may be elements that contribute to developing their abilities. The number of Grade 5 and Grade 9 students were used as the variables for student size.

3.3 Relationship between the Pass Rate and Factors Affecting It

(1) Pass Rate and Type of School

First of all, the relationship between the pass rate and factors that may be influential were analyzed. The pass rate of a group was defined as the number of students who passed among those who took the examination. Since the number of students who took the examination and passed was known, the rate was calculated. As a matter of fact, it was easier to calculate the pass rate by each school first, then to calculate the mean of the school pass rate weighted by the number of students who took the examination.

Figure 1 shows the pass rate of Grade 5 by type of school. The figure shows not only the mean figure, but the 95% confidence interval to show the variance. Contrary to the assumption that the pass rate would be the highest at the high school and the lowest at the

branch primary school, there was no clear tendency and in actuality, the pass rate was the highest at the primary school. Figure 2 shows the case of Grade 9. The pass rate was the highest at the middle school, but not at the high school. An interpretation of this phenomena is given later.

Figure 1 Pass Rate of Grade 5 by Type of School

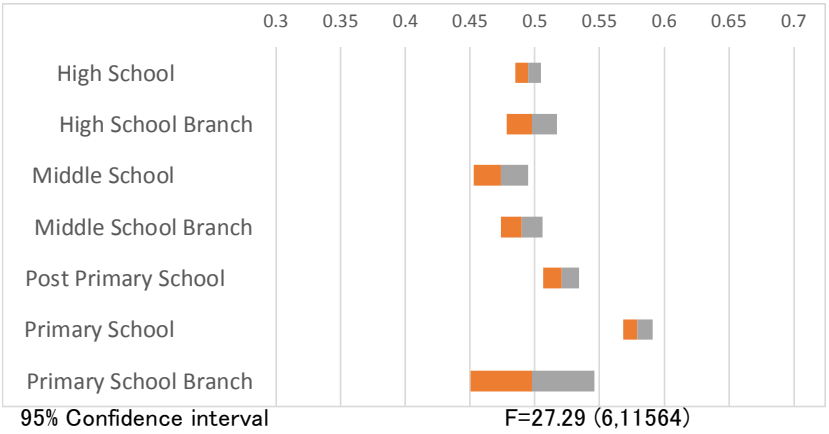
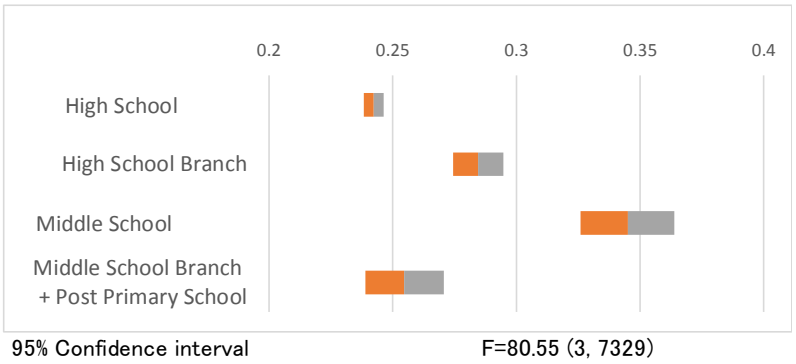


Figure 2 Pass Rate of Grade 9 by Type of School



(2) Pass Rate and School Ranking

Figure 3 shows the pass rate by school ranking for Grade 5. Although the "A" showed the highest score as expected, the trend after "B" was contrary to the assumption. Figure 4 shows the pass rate by school ranking in Grade 9. The trend was not clear and "E" showed the highest pass rate. Compared to "A" and others, the variance was small for "A" for both Grade 5 and Grade 9.

Figure 3 Pass Rate of Grade 5 by School Ranking

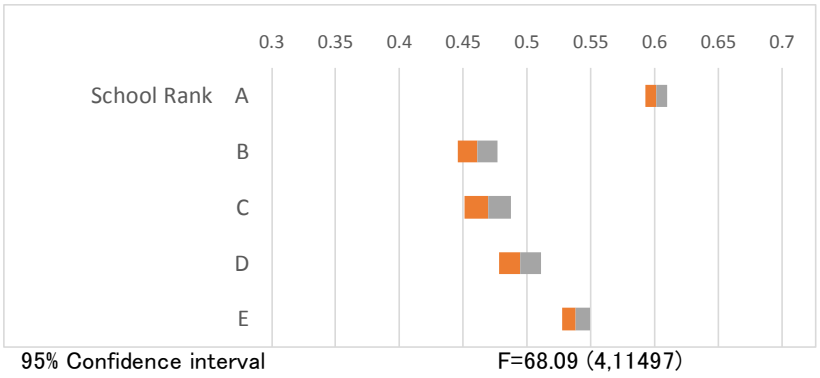
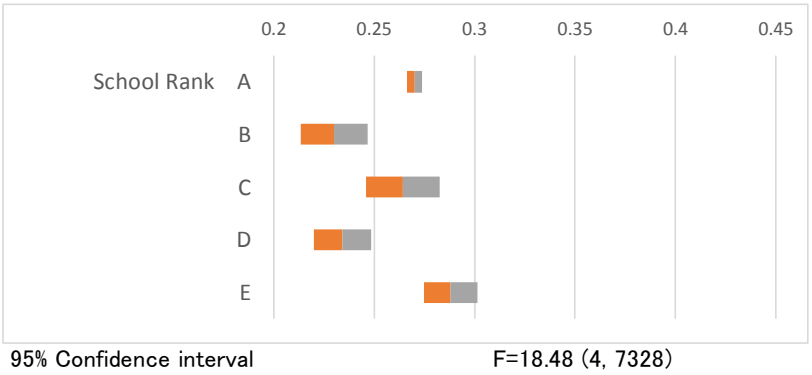


Figure 4 Pass Rate of Grade 9 by School Ranking



(3) Pass Rate and District

Figure 5 shows the pass rate by district for Grade 5. Compared to two other districts, the pass rate for Falum was extremely low. Since the examination questions were developed and marked at the district level, the figure did not mean that the ability of students in Falum was low, but that the level was simply difficult. Figure 6 shows the pass rate by district for Grade 9. In this case, there was no clear difference among the three districts. The reason may be because the examination questions were developed and marked by state/region, the difference among districts was minimized.

Figure 5 Pass Rate of Grade 5 by District

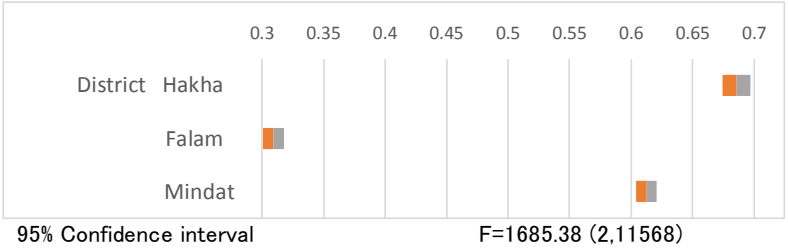
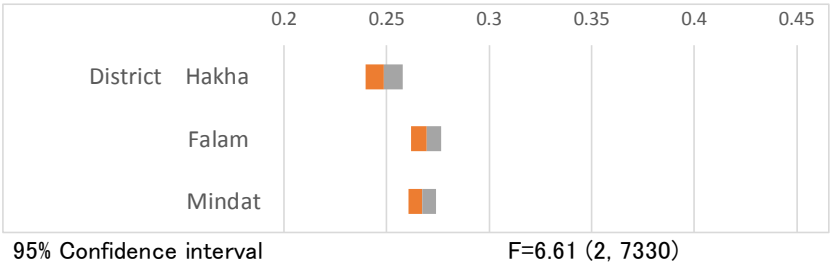


Figure 6 Pass Rate of Grade 9 by District



(4) Pass Rate and S/T Ratio

Figure 7 shows the pass rate according to S/T ratio for Grade 5. The results were as anticipated. It is clear that if the S/T ratio is smaller, the pass rate is higher. The pass rate was adequately high when the S/T ratio is less than 20. Figure 8 also shows the pass rate by S/T ratio for Grade 9 as well as a clear trend. There was a 17% point difference of equal or less than 10 and more than 30.

Figure 7 Pass Rate of Grade 5 by S/T Ratio of Primary School Level

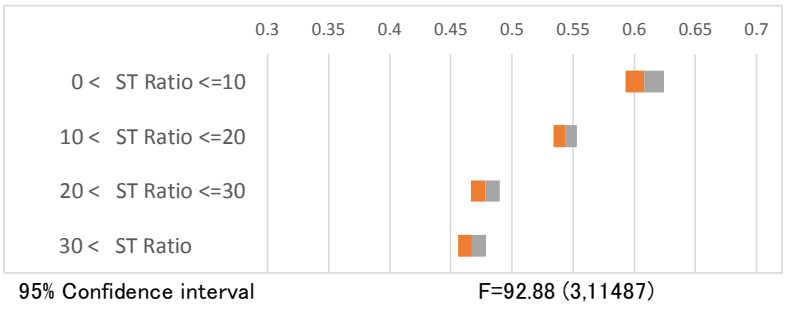
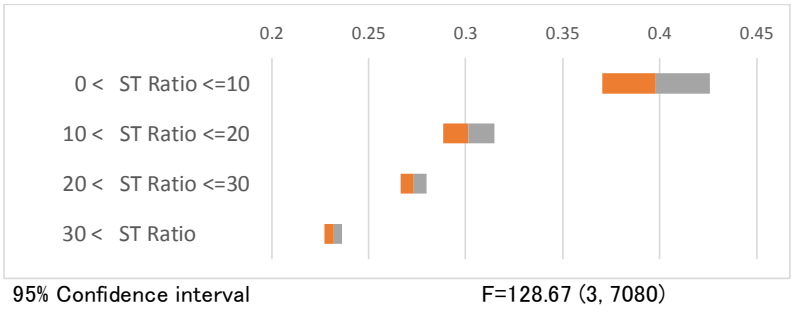


Figure 8 Pass Rate of Grade 9 by S/T Ratio of Middle School Level



(5) Pass Rate and Size of Students

Figure 9 shows the pass rate according to the number of Grade 5 students. The tendency for the pass rate to be higher when the number of students was smaller was clearly seen. A

smaller number of students allows for easier management, but there is also some correlation with the S/T ratio. Figure 10 depicts what happens in the case of Grade 9. Although the variance was slightly high, the pass rate was the highest for the group of less than 10 students. The second highest group was between 20 and 30 students.

Figure 9 Pass Rate of Grade 5 by Number of Grade 5 Students

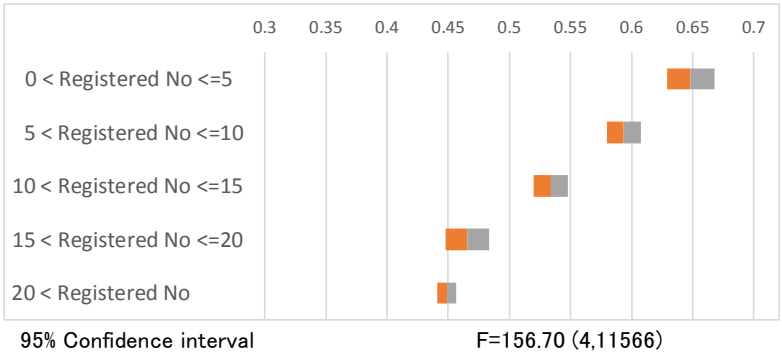
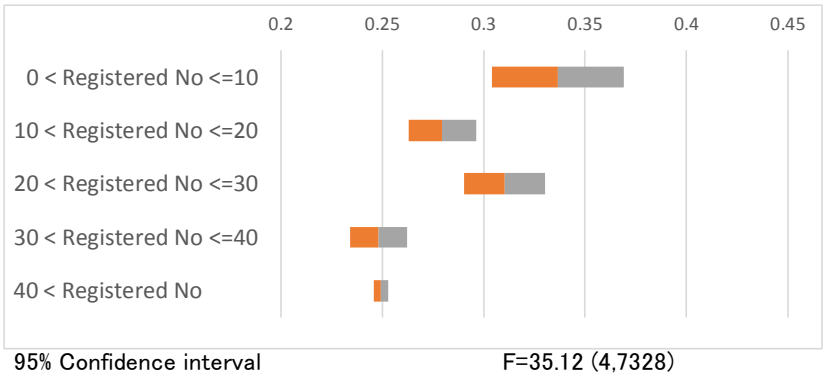


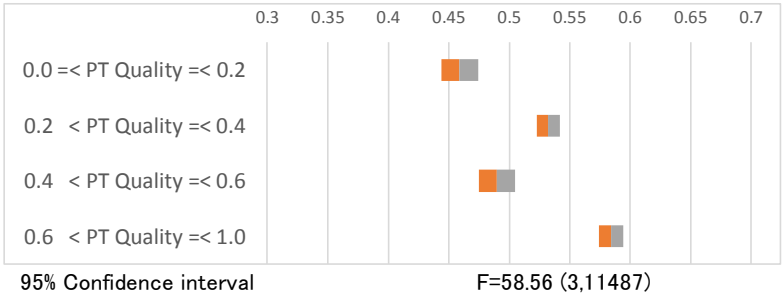
Figure 10 Pass Rate of Grade 9 by Number of Grade 9 Students



(6) Pass Rate and Quality of Teachers

Figure 11 shows the pass rate according to the quality of teachers at the primary school level. The overall pass rate was high if the quality of primary school level teachers was high, although there were signs of a partial reversal.

Figure 11 Pass Rate of Grade 5 by Quality of Teachers



(7) Correlation of Variables Affecting the Pass Rate

As described above, the anticipated influences of several factors on the pass rates was not always confirmed. It may be possible that a few of the expectations were wrong. However, it is also possible the analysis results were influenced by a correlation between factors underlying the pass rate. The main correlations are shown from Figure 12 to Figure 21 based on the School Basic Dataset. For example, Figure 12 shows the relationship between the type of school and the number of Grade 5 students. A large number of students tended to attend high schools or middle schools. If the school was considered prestigious, they tended to have a larger number of students. This is understandable as a condition to become a high school or middle school. However, a large number of students means a low pass rate as shown in Figure 9. The large number of Grade 5 students appears to offset the advantage of high schools and middle schools.

Figure 12 Number of Grade 5 Students per School by School Type

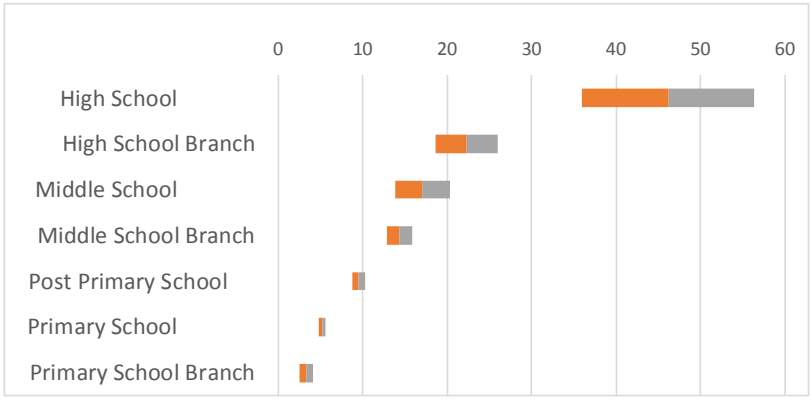
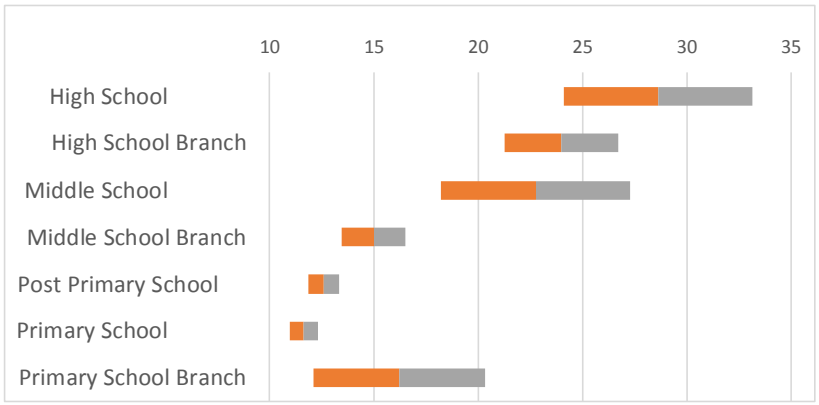


Figure 13 shows the relationship between the S/T ratio and the type of school. If the level of the school type was high, the S/T ratio was also high with the exception of the branch primary school. According to the vast expansion in the number of daily wage temporary teachers, who were mainly introduced in local primary schools, the S/T ratio at primary

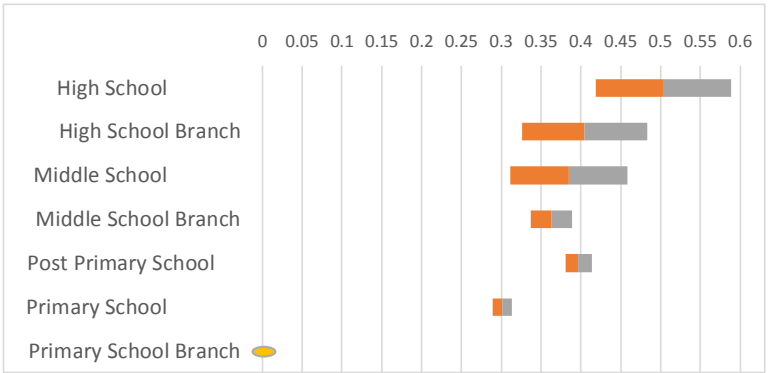
school level of primary school, post primary schools, and branch middle schools improved rapidly (Muta 2015a, 2015b). In contrast, although the branch primary schools were established to improve the enrollment, the number of teachers was still inadequate.

Figure 13 S/T Ratio at the Primary School Level by School Type



As described above, if the status of a school is prestigious such as a high school, students with higher motivation and students whose families are wealthy tended to gather at these schools. However, this contributed to a larger number of students and a higher S/T ratio. Although other factors such as teacher quality was high, if the school had a high status as shown in Figure 14, the positive factors for higher achievement were offset by negative factors; and the results became unclear as shown in Figure 1.

Figure 14 Quality of Primary School Teacher Level by School Type



The same was also true in the case of school ranking. Figure 15 shows that there was a higher number of Grade 5 students if the ranking was "A" in contrast to schools with a lower ranking. An "A" ranking attracted many students.

Figure 15 Number of Grade 5 Students per School by School Ranking

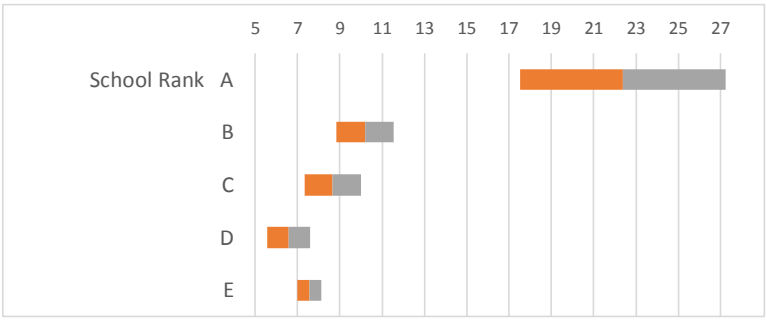
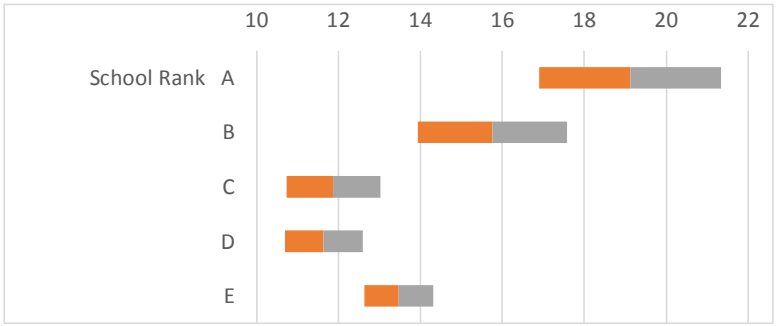


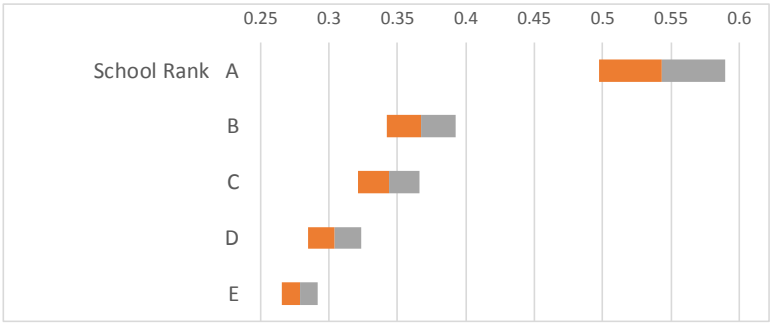
Figure 16 shows the S/T ratio at primary school levels according to school ranking. The S/T ratio was lower when the school ranking was "C", "D", "E" rather than "A" and "B" because of the recent increase in daily wage temporary teachers in these areas. In conclusion, a higher S/T ratio may have offset the advantage of schools ranked as "A".

Figure 16 S/T Ratio of Primary School Level by School Ranking



As it was pointed out in previous research studies (Muta 2015a、2015b), and as shown in Figure 17, the quality of teachers and school ranking have a strong correlation. A school ranked as "A" has a higher quality of teachers. Although the school ranking was a good proxy for student SES, when several educational conditions were intricately combined, then it made the interpretation of Figure 3 difficult.

Figure 17 Quality of Teachers at Primary School Level by School Ranking



It was same in the case of Grade 9. When the number of Grade 9 students was calculated, it was found that the number was extremely high at high schools as shown in Figure 18. When the S/T ratio was calculated by school type, it was highest at the high school as shown in Figure 19. There may have been an adequate number of teachers at the middle school level of a high school, but it attracted many students from neighboring areas because of its high reputation. In contrast, many primary school graduates proceeded to attend post primary schools or branch middle schools where the number of teacher were still inadequate. Ironically, the high S/T ratio may decrease the pass rate even at high schools where the pass rate is expected to be high.

Figure 18 Number of Grade 9 Students per School by School Type

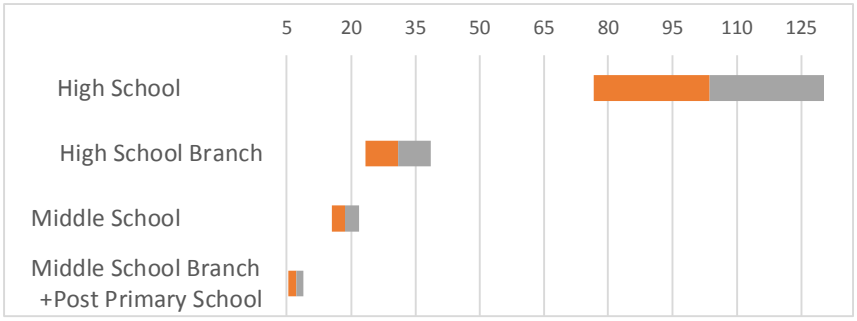
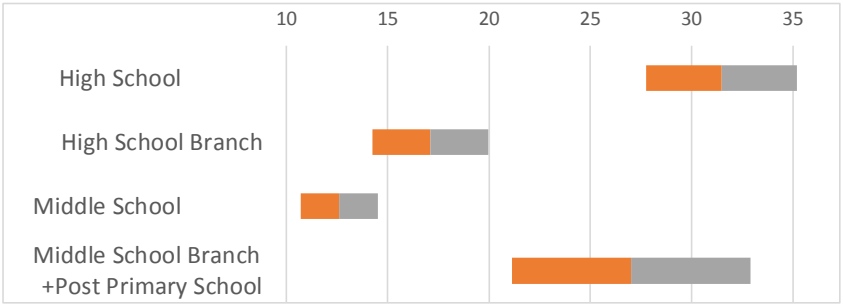


Figure 19 S/T Ratio at Middle School Level by School Type



It is same for school rankings. As shown in Figure 20, the number of Grade 9 students was very high in schools ranked "A" and it may have been the cause for the high S/T ratio as shown in Figure 21. This is why the pass rate was not high for schools ranked "A," which differed from initial expectations as shown Figure 4.

Figure 20 Number of Grade 9 Student per School by School Ranking

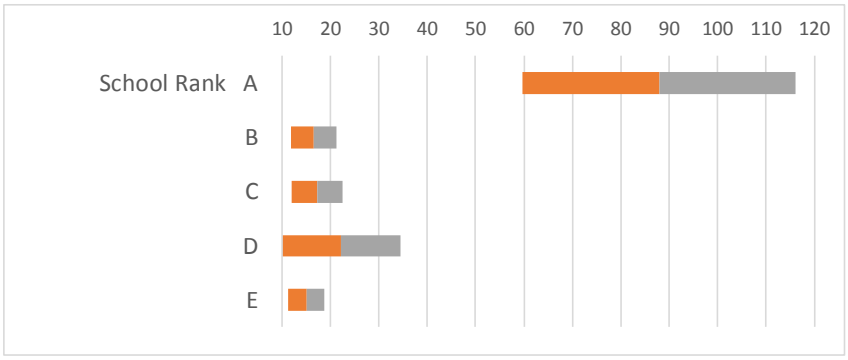
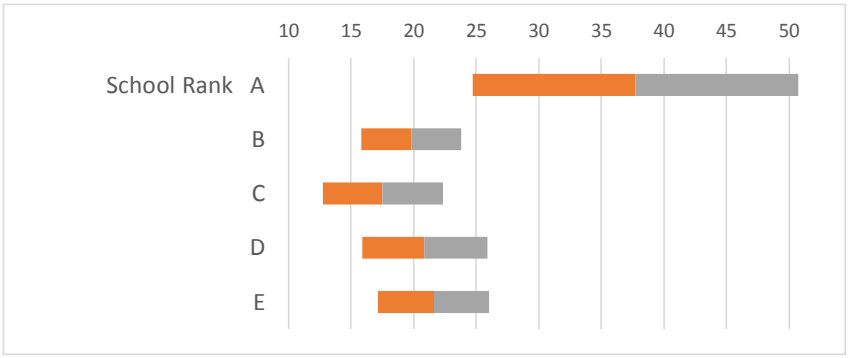


Figure 21 S/T ratio at Middle School Level by School Ranking



3.4 Contribution of Each Factor Affecting the Pass Rate

As explained in the previous sections, factors that may have influenced the pass rate were correlated. Thus, the unique contribution of each factor could not be clearly identified when it was checked one by one. Regression analyses were conducted to find the unique contribution of each factor. The type of school, school ranking, and district were discrete variables from the start. The S/T ratio, quality of teachers, number of students were continuous variables. However, there was no guarantee that the relationship between the pass rate and these variables were linear. These variables were then categorized into an almost equal number of schools. In this way, all of the explanatory variables were converted to dummy variables. The sample unit in the Combined Dataset was a school. As the size of the schools varied, the school was weighted by the number of students who took the examination which was the base of calculating a pass rate when the regression analyses were conducted.

Table 3 shows the result of linear regression analysis. The explained variable was the pass rate for Grade 5, and the explanatory variables were the type of school, school ranking, district, and variables for educational conditions such as S/T ratio, number of students, and

quality of teachers.

Table 3 Factors Explaining the Pass Rate for Grade 5

Variables		Regression Coef.	Range (Max-Min)	t Value
School Type	High School	0.0934	0.1592	3.84
	High School Branch	0.1592		6.37
	Middle School	0.1281		5.20
	Middle School Branch	0.0832		3.44
	Post Primary School	0.0847		3.63
	Primary School	0.0793		3.51
	Primary School Branch	0.0000		-
School Rank	A	0.0963	0.1323	9.76
	B	-0.0278		-3.44
	C	-0.0332		-3.65
	D	-0.0359		-4.43
	E	0.0000		-
District	Hakha	0.0640	0.3458	9.00
	Falam	-0.2818		-46.06
	Mindat	0.0000		-
Average ST Ratio	0 < ST Ratio <=10	0.1040	0.1040	8.82
	10 < ST Ratio <=20	0.0785		8.41
	20 < ST Ratio <=30	0.0561		6.21
	30 < ST Ratio	0.0000		-
Number of Grade 5 Students	0 < Registered No <= 5	0.1982	0.1944	15.46
	5 < Registered No <=10	0.1270		12.43
	10 < Registered No <=15	0.0690		7.34
	15 < Registered No <=20	0.0038		0.38
	20 < Registered No	0.0000		-
Quality of teachers	0.0 =< PT Quality =< 0.2	-0.1111	0.1111	-10.18
	0.2 < PT Quality =< 0.4	-0.0622		-6.74
	0.4 < PT Quality =< 0.6	-0.0480		-4.85
	0.6 < PT Quality =< 1.0	0.0000		-
	Constant	0.4337		16.75

Adj R-squared = 0.3033 F=228.01 (22, 11448)
Number of obs = 11471

Concerning the type of school, the Branch High School and Middle School showed a larger regression coefficient. Compared to the results in Figure 1, general tendency, which was the higher the reputation, the stronger the influence, became clearer in Table 3. For school ranking, "A" showed the highest influence. The variables on educational conditions showed the expected results. If the S/T ratio was high, the pass rate was high; if the number of students was small, the pass rate was high; and if teacher quality was high, the pass rate was high.

The most interesting finding in this table was the contribution of each factor variable. Since all of the categories for each factor were dummy variables, the regression coefficient showed the degree the pass rate changed if the case was "true." Thus, the range that was defined as

the difference between the maximum and minimum coefficients among the same factor variable showed how much the factor contributed in changing the pass rate. It showed the relative contribution of the factor variable. For example, the coefficients of S/T ratio in Table 3 showed that the pass rate of “more than 20 and equal or less than 30” was 0.0561 point higher than “more than 30”. When the ratio was “more than 10 and equal or less than 20”, the pass rate increased 0.0224 point more. And when the ratio was “equal or less than 10”, it increased 0.0255 points more. As a total, the difference of S/T ratio changed the pass rate 0.1040 point.

In Table 3, the districts showed the greatest range. As the difficulty of the examination questions depended on the district, this was unavoidable. The second largest range was the number of students, which was 0.1982, followed by the type of school, school ranking, quality of teachers, and S/T ratio. As the district variable was special, it was not considered further. The sum of two factors, which were proxies for family-related variables, school type and school ranking, was 0.2914, and the sum of three factors on educational conditions was 0.4096. This meant the educational conditions, which were school-related variables, were able to change the pass rate much more greatly. The maximum and the minimum figures of the estimated pass rate were easily calculated using the maximum or minimum coefficient of each factor variable, and these were 0.9897 and 0.0087. They fit into a range of 0 to 1.

Table 4 shows the pass rate for Grade 9. The pass rate for school ranking "A" was small in Figure 4, but it was larger than the other categories in Table 4, which indicated its influence to control other variables. Because the examination questions were mainly developed by the state/region, the range of the district was small at 0.0339. Among the factors related to educational conditions, it was clear that the smaller the S/T ratio, the higher the pass rate. Unlike Grade 5, the coefficient was the highest where the number of students was 21-30, followed by 1-10 students. The order of the range was S/T ratio, school ranking, type of school, and the number of students from the largest to the smallest. The sum of two factors, school type and school ranking, was 0.2162, and the sum of two factors on educational conditions was 0.2314. The range of factors related to educational conditions was slightly exceeded. The estimated maximum pass rate was 0.5485 and the minimum was 0.0955.

Table 4 Factors Explaining the Pass Rate for Grade 9

Variables		Regression Coef.	Range (Max-Min)	t Value
School Type	High School	−0.0309	0.0859	−3.12
	High School Branch	−0.0024		−0.24
	Middle School	0.0550		5.42
	Middle School Branch + Post Primary	0.0000		−
School Rank	A	0.0347	0.1303	4.56
	B	−0.0957		−11.35
	C	−0.0313		−3.26
	D	−0.0408		−4.92
	E	0.0000		−
District	Hakha	−0.0339	0.0339	−5.90
	Falam	−0.0001		−0.02
	Mindat	0.0000		−
Average ST Ratio	0 < ST Ratio <=10	0.1465	0.1465	12.12
	10 < ST Ratio <=20	0.0598		7.78
	20 < ST Ratio <=30	0.0419		7.27
	30 < ST Ratio	0.0000		−
Number of Grade 9 Students	0 < Registered No <=10	0.0354	0.0849	2.34
	10 < Registered No <=20	0.0111		1.00
	20 < Registered No <=30	0.0643		6.03
	30 < Registered No <=40	−0.0206		−2.20
	40 < Registered No	0.0000		−
	Constant	0.2481		21.96

Adj R-squared = 0.1104 F=54.8 (16, 7067)
Number of obs = 7084

The above estimates were calculated using the linear regression analysis. When pass rates were estimated using the calculated coefficients, the figures were in the range of 0 to 1 in this case. However, this is not generally guaranteed. An estimated pass rate value may be less than 0 or more than 1 because of the nature of the analysis. Suppose the pass rate shows the possibility of the student taking the test to pass. A pass rate can be transferred to a logit (log of odds) and this logit can be used as explained variable in a linear regression analysis. An estimated figure can be easily transferred to a pass rate (probability to pass) and the figure never exceeds the range from 0 to 1.

The logit is defined by the following formula;

Logit (p) = ln (p / (1-p)) where "p" shows the pass rate.

According to this definition, the logit value cannot be calculated when "p" is either 0 or 1. In this research, the extreme pass rate based on a school such as 0 or 1 occurred when the number of students who took the examination was very small. In fact, there were 166 schools whose pass rate for Grade 5 was 0 and 336 schools whose pass rate was 1. If the original pass rate was used, a total of 502 schools, which was 41% of the sample, would be dropped. There were 40 schools where the pass rate for Grade 9 was 0 and 8 schools with a pass rate was 1. If the original pass rate was used, a total of 48 schools, which was 22% of the sampling, would also be dropped. To prevent these drops, the value of 0 and 1 were modified as 0.01 and 0.99 after considering that the maximum number of students in such

extreme cases seemed to be a maximum of two digits. The actual range of school pass rates except 0 and 1 was 0.250 to 0.947 for Grade 5, and 0.037 to 0.964 for Grade 9. The order of the pass rate would not be reversed when 0 and 1 were modified as 0.01 and 0.99. In addition, if the modified values were very close to 0 or 1, the value of logit became extremely small or large, which would distort the estimated coefficients.

Table 5 Factors Explaining the Logit of the Grade 5 Pass Rate

Variables		Regression Coef.	Range (Max-Min)	t Value
School Type	High School	0.8544	1.3539	4.51
	High School Branch	1.3539		6.95
	Middle School	1.0201		5.32
	Middle School Branch	0.7884		4.19
	Post Primary School	0.7703		4.23
	Primary School	0.7209		4.09
	Primary School Branch	0.0000		-
School Rank	A	0.4544	0.7222	5.91
	B	-0.1257		-1.99
	C	-0.2678		-3.78
	D	-0.2264		-3.58
	E	0.0000		-
District	Hakha	0.6211	2.5685	11.21
	Falam	-1.9473		-40.83
	Mindat	0.0000		-
Average ST Ratio	0 < ST Ratio <=10	0.7514	0.7514	8.17
	10 < ST Ratio <=20	0.5063		6.95
	20 < ST Ratio <=30	0.4090		5.81
	30 < ST Ratio	0.0000		-
Number of Grade 5 Students	0 < Registered No <= 5	1.4903	1.5876	14.91
	5 < Registered No <=10	0.8871		11.14
	10 < Registered No <=15	0.2984		4.07
	15 < Registered No <=20	-0.0973		-1.23
	20 < Registered No	0.0000		-
Quality of teachers	0.0 =< PT Quality =< 0.2	-0.5490	0.5490	-6.45
	0.2 < PT Quality =< 0.4	-0.2501		-3.47
	0.4 < PT Quality =< 0.6	-0.1975		-2.56
	0.6 < PT Quality =< 1.0	0.0000		-
	Constant	-0.6996		-3.47
	Adj R-squared = 0.2613	F=185.44 (22, 11448)		
	Number of obs = 11471			

Table 5 shows the regression analysis results for Grade 5 after the pass rates were converted to logits based on this idea. The tendency for the order of coefficients was almost the same as Table 3. The total range of variables related to school type and ranking was 2.0761. In contrast, the total of range of variables related to educational conditions was 2.8880, and it excelled over the variables related to school type and ranking. The maximum and the minimum values of logits were estimated as 3.4720 and -3.5610; these were equivalent to the pass rates of 0.9699 and 0.0276.

Table 6 shows the regression analysis results for Grade 9 using the same idea. The tendency in the order of coefficients was almost the same as Table 4. The total range of variables related to school type and ranking was 1.3832. In contrast, the total of range of variables related to educational conditions was 1.5269, and it also excelled over the variables related to school type and ranking. The maximum and the minimum values of logits were estimated as 0.4765 and -2.5820; these were equivalent to the pass rates of 0.6169 and 0.0703.

Table 6 Factors Explaining the Logit of the Grade 9 Pass Rate

Variables		Regression Coef.	Range (Max-Min)	t Value
School Type	High School	−0.0602	0.3380	−0.84
	High School Branch	0.1216		1.69
	Middle School	0.2779		3.77
	Middle School Branch + Post Primary	0.0000		−
School Rank	A	0.2367	1.0452	4.30
	B	−0.8085		−13.22
	C	−0.3620		−5.20
	D	−0.5792		−9.64
	E	0.0000		−
District	Hakha	−0.1483	0.1483	−3.57
	Falam	−0.0274		−0.70
	Mindat	0.0000		−
Average ST Ratio	0 < ST Ratio <=10	1.0787	1.0787	12.30
	10 < ST Ratio <=20	0.3041		5.46
	20 < ST Ratio <=30	0.2486		5.95
	30 < ST Ratio	0.0000		−
Number of Grade 9 Students	0 < Registered No <=10	−0.0228	0.4482	−0.21
	10 < Registered No <=20	−0.1695		−2.10
	20 < Registered No <=30	0.2362		3.06
	30 < Registered No <=40	−0.2120		−3.12
	40 < Registered No	0.0000		−
	Constant	−1.3531		−16.51

Adj R-squared = 0.0956 F=47.81 (16, 7067)
Number of obs = 7084

4. Conclusion and Policy Implications

The scholastic achievement examination for Grade 5 and Grade 9 students held in February 2015 was a nationwide examination that was a first-time experience for the students. The examination questions were developed for all major subjects by the district for Grade 5, and by the state/region for Grade 9. This examination did not aim to investigate whether the scholastic ability, which the national curriculum targeted had been achieved or not. It was designed to confirm if individual students had the scholastic ability to graduate from primary school or middle school levels. That was why the students, who failed the examination, had to take supplementary classes and a supplementary examination to move on to the next grade.

The examination questions were not standardized to make a comparison possible between regions or academic years, and the only available variable on the scholastic achievement results was the pass rate of each school. The information about factors that may have influenced scholastic achievement such as student motivation, time to study, and family background of the students were not collected. In this regard, the data on examination results were not suited to analyzing the factors influencing scholastic achievement. However, this kind of large-scale data was rare; and it was possible that a careful analysis would draw some useful implications despite the limitations.

As information exists on schools where students study, the Pass Rate Dataset was combined with the School Basic Dataset, after which the relationship between the pass rate and the information on schools were analyzed. One of the basic data on school characteristics was the state/region, district, school type and school ranking. As the examination questions were developed and managed by the district for Grade 5 and the state/region for Grade 9, the interpretation of the results should be the difference in the difficulties encountered between districts or states/regions. Other variables related to school type and school ranking were considered to be strong proxies for student motivation and the SES of the family. Other variables representing the educational conditions that greatly affect scholastic achievement were S/T ratio, number of students, and quality of teachers.

According to an analysis of the Chin State data, the following conclusions were reached.
1) The type of school or school ranking which were considered to be proxies of student motivation and SES showed significant influence that explained the pass rates, but the variables on educational conditions explained the pass rates further.
2) The smaller the S/T ratio, higher the pass rate both for Grade 9 and Grade 5.
3) The higher the quality of teachers, the higher the pass rate for Grade 5.
4) The smaller the number of students, the higher the pass rate for Grade 5. The pass rate was the highest when the number of Grade 9 students were between 20 and 30.

As the results indicates, educational conditions that are changeable policy variables such as S/T ratio, educational quality, manageable and appropriate student sizes affected the pass rate significantly, and the effect was greater than the effects caused by school type and ranking, which were the proxies for family-related variables. This implied that scholastic achievement could be improved by improving these educational conditions. These implications supported the current educational policies to establish small schools in local areas to boost the enrollment rate and to employ daily wage temporary teachers for deployment to local small schools as appropriate.

The examination for Grade 5 and Grade 9 conducted in February 2015 did not aim to analyze the effect of factors contributing to scholastic achievement. Despite this, as this paper showed, useful implications can be obtained based on appropriate analyses. It was possible to make the analysis results more fruitful if additional data were added to this dataset. The following policy implications were drawn from this study.

1) The school code is necessary for effective and efficient analyses in future.
As shown in this study, different datasets can be combined if they have a common variable. If the datasets have more variables, several more interesting analyses become possible. To create a meta-dataset, a simple and non-changeable variable common to all datasets is necessary. The name of the school was used as the common variable in this study, but it was difficult to combine even two datasets as described based on the name of the school. The school code should be decided in the near future by the Ministry of Education and it should be used in all of the school statistics from now on. When the school code is decided, it should remain unchanged until the school is closed. When the school is closed, the code should not be used again. A school may develop, be promoted and change its name, but the school code should never change. The type of school and the name are important variables. If the school code does not change, it is possible to follow the development of any school chronologically.

The information on educational statistics is rather abundant in the Republic of the Union of Myanmar compared to other developing countries. However, it is not possible to combine several datasets together for useful analysis because of the lack of a school code. For example, there must be a dataset on the condition of school facilities and equipment which affect scholastic achievement, but the dataset cannot be merged without a school code. It is not costly to set a school code for each school and it is possible to create them quickly. The school statistics are collected monthly, and it is only requires that the school code be added to the data along with the name of school from now on. This simple practice can help greatly to utilize the accumulated educational data appropriately and thoroughly.

2) A nationwide standardized scholastic achievement examination is necessary.
Scholastic achievement is the most basic outcome of an educational system in any country, and an analysis of the current status and factors affecting scholastic achievement is required to find effective and efficient ways to improve the situation, and to make appropriate educational plans for the future. There is no such mechanism in the country right now. Thus, it is necessary to develop an assessment system on scholastic achievement and to collect related variables with the goal of contributing to an international comparative survey in the near future.

3) Similar comparative analyses of other states/regions are necessary.

This study analyzed Chin State alone. Although some implications for improving education were seen, it is not known to what extent the results can be used to generalize conditions for other states/regions. The degree that educational conditions can explain the pass rate may depend on the states/regions, but it should be confirmed. It is mostly the responsibility of the author to do so, and additional studies are expected to be carried out.

Reference

Baker, D.P., Goesling, B. and Letendre, G. K. (2002) Socioeconomic Status, School Quality, and National Economic Development: A Cross-National Analysis of the "Heyneman-Loxley Effect" on Mathematics and Science Achievement. *Comparative Education Review*, 46 (3), 291-312.

Coleman, J. S., Cambell, E. Q., Hobson, C. J., Mcpartland, J., Mood, A. M., Weinfeld, F.D. and York, R. L. (1966) *Equality of Educational Opportunities,* U.S. Department of Health, Education and Welfare.

Glass G.V. and Smith M.L. (1979) Meta-Analysis of Research on Class Size and Achievement, *Educational Evaluation and Policy Analysis*, 1(1), 2-16.

Heyneman, S.P. and Loxley, W.A. (1983) The Effect of Primary School Quality on Academic Achievement across Twenty-nine High- and Low- Income Countries, *American Journal of Sociology*, 88(6), 1162-1194.

Muta, Hiromitsu (2014a) *Study on the Future Expansion of Education due to Reduced Dropouts,* 20140211.

Muta, Hiromitsu (2014b), *In-deSTh Analysis on Promotion, Repetition and Dropout of Basic Education in Myanmar*, Research paper 20141105.

Muta, Hiromitsu (2015a) *Regional Disparity of Educational Conditions in Townships and the Effect of the Policy on Daily Wage Temporary Teachers - Statistical Analyses Based on Individual Basic Education School Data* -, 20150221.

Muta, Hiromitsu (2015b) *Evaluation Study on "Having at least Five Teachers at One School" Policy in 2014 -Has the Regional Disparity in Educational Conditions Diminished?-,* 20150620.

Tomita, M. and Muta, H. (2012) The Comparison of the Influence of School Factors and Family-Related Factors on Learning Achievements : Confirmation and Policy Implication of HL Effect in Low-Income Countries from MALP Example in Malawi, *Journal of international cooperation in education*, 15(1), 21-36.

The World Bank (2015) *Myanmar Early Grade Reading Assessment (EGRA) for the Yangon Region, 2014 Results Report,* Report No: ACS13261.