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การกระจายการศึกษาในระบบโรงเรียนในประเทศไทย

(The Distribution Flow of Education in the Formal School System in Thailand : An Analysis on Factors Affecti cholastic Achievement of Students at Different Level of Edu

by

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(The Distribution Flow of Education in the Formal School System in Thailand : An Analysis on Factors Affecting Scholastic Achievement of Students at Different Level of Education)

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This report is the first part of the research project jointly undertaken by Dr. Sukanya Nitungkorn, Dr. E.A. Tan, Ms. Chitra Vutisart and Ms. Wannasiri Naiyavitit. The second part of the project will be published as another report in this series.

บทคัดย่อ

งานวิจัยเรื่อง

การกระจายการศึกษาในระบบโรงเรียนในประเทศไทย

วัตถุประสงค์ของงานวิจัยนี้มุ่งวิเคราะห์การกระจายการศึกษาในระบบโรงเรียนในประเทศไทย โดยวัด "การศึกษา" จากความสามารถในการเรียนรู้ หรือสัมฤทธิ์ผลทางการศึกษาของนักเรียน เพื่อที่จะดูการกระจายของสัมฤทธิ์ผลทางการศึกษาของนักเรียนที่มาจากครอบครัวที่มีฐานะทางเศรษฐกิจและสังคมต่างกัน และศึกษาองค์ประกอบทางด้านโรงเรียนและครอบครัวที่มีอิทธิพลในการกำหนดสัมฤทธิ์ผลทางการศึกษาของนักเรียน และดูว่าอิทธิพลขององค์ประกอบเหล่านี้มีการเปลี่ยนแปลงหรือไม่ในระหว่างนักเรียนซึ่งแตกต่างกันตามระดับชั้นเรียน

เนื่องจากข้อจำกัดในด้านเวลา ข้อมูล และงบประมาณค่าใช้จ่าย การวิเคราะห์ในทุกระดับชั้นเรียนจึงมิอาจทำได้ การวิเคราะห์ทางสถิติจึงจำกัดอยู่ในระดับชั้นประถมศึกษาตอนต้น และชั้นมัธยมศึกษาตอนปลาย ข้อมูลที่ใช้ในการวิเคราะห์ในระดับประถมศึกษาคือข้อมูลชุดประถมศึกษาปีที่ ๓ โดยความอนุเคราะห์ของคณะกรรมการการศึกษาแห่งชาติ ส่วนข้อมูลระดับมัธยมศึกษาได้จากแบบสอบถามเกี่ยวกับภูมิหลังครอบครัวและการเรียนในระดับมัธยมศึกษาปลาย (มศ.๕) ซึ่งผู้วิจัยได้สุ่มตัวอย่างนักศึกษาปีที่หนึ่งในสถาบันอุดมศึกษาทั้งของรัฐและเอกชนทั่วประเทศ นอกจากนี้ยังได้ข้อมูลเกี่ยวกับโรงเรียนจากรายงานประจำปีซึ่งโรงเรียนต่าง ๆ รายงานให้แก่กระทรวงศึกษาธิการ

วิธีการวิเคราะห์ทางสถิติได้ใช้เครื่องมือ multiple regression analysis ผลการวิเคราะห์ในระดับประถมศึกษา พบว่าองค์ประกอบทางด้านครอบครัวและตัวนักเรียนมีอิทธิพลต่อสัมฤทธิ์ผลทางการศึกษา (ซึ่งวัดจากคะแนนการทดสอบมาตรฐาน) ของนักเรียนอย่างมีนัยสำคัญ แต่ถ้าองค์ประกอบทางด้าน

โรงเรียนปรากฏอยู่ในสมการเดียวกัน จะมีผลทำให้สัมประสิทธิ์ของตัวแปรที่วัดองค์ประกอบทางด้านครอบครัวลดความสำคัญลงอย่างมาก โดยเฉพาะตัวแปรที่วัดฐานะทางเศรษฐกิจและสังคมของครอบครัวคืออาชีพบิดา ปรากฏว่าไม่มีนัยสำคัญทางสถิติอีกต่อไป ทั้งนี้เพราะสหสัมพันธ์ของตัวแปรต่าง ๆ ที่วัดองค์ประกอบทางด้านครอบครัวและโรงเรียนมีค่าสูงมาก นั่นคือ ฐานะทางเศรษฐกิจและสังคมของครอบครัวมีความสัมพันธ์อย่างมากกับชนิดของโรงเรียนที่เด็กเข้าเรียน โรงเรียนในระดับหมู่บ้านมีแต่โรงเรียนองค์การบริหารส่วน - จังหวัด ซึ่งมีคุณภาพด้อยที่สุดเมื่อเปรียบเทียบกับโรงเรียนเอกชน โรงเรียนกรมสามัญและโรงเรียนเทศบาล และโรงเรียนองค์การฯ นี้เกือบจะเป็นโรงเรียนประเภทเดียวที่ชาวนาสามารถส่งบุตรเข้ารับการศึกษาได้ ผลการวิเคราะห์พบว่าคะแนนเฉลี่ยนักเรียนที่เคยผ่านการศึกษาอนุบาลสูงกว่าผู้ที่ไม่เคยเข้าเรียนอนุบาลอย่างมีนัยสำคัญ โรงเรียนระดับอนุบาลมักตั้งอยู่ในเขตชุมชนซึ่งเด็กในตัวเมืองเท่านั้นจึงมีโอกาสเข้ารับการศึกษาระดับนี้

แม้ว่าองค์ประกอบด้านโรงเรียนและองค์ประกอบทางด้านครอบครัวจะมีความสัมพันธ์กันอย่างมาก แต่การวิเคราะห์ก็สามารถทดสอบได้ว่าองค์ประกอบทางด้านโรงเรียนหลายประการ มีอิทธิพลต่อสัมฤทธิ์ผลทางการศึกษาอย่างมีนัยสำคัญ เช่น ความสามารถทางวิชาการของครู, ความเอาใจใส่ของครู, ขนาดของโรงเรียนวัดจากจำนวนห้องเรียน, ประเภทของโรงเรียนซึ่งมีความหมายในด้านการจัดการบริหารโรงเรียน

ระบบการศึกษาของไทยเป็นระบบซึ่งให้ความสำคัญแก่การสอบได้ และเป็นการสอบที่เน้นความสามารถทางวิชาการของนักเรียนไม่ว่าจะเป็นการสอบเลื่อนชั้นเรียนหรือคัดเลือกเข้าสถานที่ศึกษาใหม่ โดยเหตุนี้นักเรียนที่ด้อยความสามารถทางด้านวิชาการจึงถูกคัดออกจากระบบโรงเรียนมากขึ้นเมื่อก้าวสู่ระดับชั้นที่สูงขึ้น นักเรียนที่รอดมาได้จึงมักจะมีความสามารถทางวิชาการค่อนข้างทัดเทียมกัน และมาจากครอบครัวที่มีพื้นฐานทางเศรษฐกิจและสังคมที่ไม่แตกต่างกันมาก

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ตัวแปรที่พบว่ามีอิทธิพลในทางลบต่อสัมฤทธิ์ผลทางการศึกษาของนักเรียนทั้งระดับประถมและมัธยมคือการเคยสอบตกของนักเรียน ซึ่งเน้นให้เห็นถึงข้อเสียเปรียบของนักเรียนที่ด้อยความสามารถทางวิชาการ ความไม่เท่าเทียมกันในโอกาสของการศึกษาตั้งแต่การศึกษาระดับต่ำยังผลให้ความไม่เท่าเทียมกันนี้ยิ่งมีมากขึ้น ในการศึกษาระดับสูง ผู้ที่เสียเปรียบในระบบนี้คือเด็กที่อาศัยในชนบทซึ่งต้องเข้าโรงเรียนที่มีคุณภาพต่ำสุด และผู้ที่ได้เปรียบคือเด็กที่อยู่ในเขตชุมชนที่มีโรงเรียนคุณภาพดีให้เลือกมากมาย การปรับปรุงสัมฤทธิ์ผลทางการศึกษาของนักเรียนอาจทำได้โดยการปรับปรุงองค์ประกอบทางด้านโรงเรียน ควรมีการคิดค้นมาตรการต่าง ๆ ในการปรับปรุงความสามารถทางวิชาการของครู มาตรการเหล่านี้อาจรวมถึงการปรับปรุงการบริหารในโรงเรียนรัฐบาลโดยเฉพาะอย่างยิ่งในโรงเรียนองค์การฯ

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Appendix

I. Introduction and Purpose of Study

Since the early 70's many developing countries have been more concerned about the problem of social equity besides accelerating economic growth. It has generally been observed that the benefits of economic development have not been equally distributed among population. Moreover, these inequalities have been increasing over time. Evidence can be found in the widening gap in the average income of the rural and the urban, the increasing number of landless farmers, a smaller percentage of the rich with a larger share in the wealth of the nation.

Education has been traditionally considered as a means to alleviate the poverty. The theoretical relationship between education and income has been fairly well established. This explains why the expenditures on education have been expanded rapidly both in absolute amount and in its relative share to total national budgetary expenditures of many developing countries. The belief that the development of education has a beneficial effect on the distribution of income has always been widespread among both laymen and scholars. This optimism is now questionable like other benefits from the development process. The fact that education provides individuals with extra earning power and enables them to move up in the social ladder is hardly been denied by anybody, however, controversies lie in the influence of changes in the distribution of education on income inequality. Many research efforts in the early 70's have been directed to investigate the distribution of education among population and to critically review its relationship with the distribution of income.

In Thailand, the government has faced with the everlasting problems of growing demand for and rising cost of education. The problems of disparities in educational opportunity among population in different regions and with different socioeconomic status are of no less importance. Research efforts on education in Thailand have reflected the growing social consciousness of existing inequalities in the society and the need to meet increasing demand for education.

Among the investigations undertaken, the project carried out jointly by the Office of the National Education Commission, Ministry of Interior and Ministry of Education on primary education in Thailand has so far been the most

comprehensive one.[1] It focused on inequality in learning as measured by achievement test scores of the grade 3 pupils. A very thorough analysis of determinants of variation in the test scores was done. The study showed that school qualities and one of the schooling system's main outcomes--cognitive skill--were not equally distributed in the Kingdom.[2] As to factors determining the variation in the test scores, it was found that the effect of socioeconomic background was essentially strong and inseparable from schooling quality factor. The factors which are important determinants of school expenditures; such as pupil-teacher ratio, space per pupil, teacher qualification and textbooks availability, account for only a small portion of scholastic achievement.

The findings of the NEC study on the ineffectiveness of schooling in promoting learning have been discouraging. This implies that there is not much hope to reduce inequality in income distribution through redistribution of educational expenditures.

In order to climb up the educational ladder, it is well recognized that students' cognitive abilities play very important role. In the Thai educational system, the progression of students to higher level of education is determined mainly by their performances in the examinations which emphasize heavily the cognitive ability.

Our purpose of study is, therefore, to investigate the determinants of the distribution of scholastic achievement of students in different levels of education. Of more importance, we would like to find out whether there is a consistency in the influence of these factors over different levels of education. Due to limitation in data and budget, we will have to confine our study to the lower primary education level and the upper secondary level. At the primary level, we will utilize data on the grade 3 pupils. This set of data was generously provided to us by the Office of the National Education Commission. In section III,

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1. It will be, henceforth, referred to as the "NEC study".
2. Office of the National Education Commission : Office of the Prime Minister, Ministry of Interior, Ministry of Education, Factors Affecting Scholastic Achievement of the Primary School Pupils; A Study on Primary Schooling in Thailand, the Final Report, Bangkok, 1977, p. 51.

we will discuss in details the data utilized in our study on the grade 3 pupils. The findings of the NEC study have very important policy implications on whether or not there is a need to equalize inputs in the Thai primary schools. However, the results are still inconclusive and the utilization of data is still not exhaustive. We would like to see of our trial would confirm or add up to those findings of the NEC.

For the upper secondary level, we will utilize our own survey data. Due to limitation of time and budget, the cheapest and most convenient way to obtain information on the school performance at the upper secondary level is to inquire from some first year college students. We also obtain information on school inputs pertaining to each student from annual school reports. These reports were filled out each year by schools all over the country upon the request of the Ministry of Education. This set of data has been generously provided to us by the Ministry of Education.

II. Conceptual Framework

This section will begin with a brief review of literature on factors affecting scholastic achievement. Some major conceptual and methodological issues encountered by studies in this area will be discussed. The general conceptual framework and statistical method to be employed in our study will follow.

A. Brief Review of Previous Work

The first and perhaps the most influential and controversial study in this area is "Equality of Educational Opportunity" or generally known as the "Coleman Report".[1] The Report is a result of an attempt to determine the extent of racial and ethnic discrimination in schools in the United States. The best known findings of the Report are quantity and quality of school inputs (facilities, curriculum and personnels) have little or no effect on students' scholastic achievement; home environment and student peers are what count. The Report demonstrates that the unique variance in achievement attributed to school inputs is extremely small. The policy relevance of input-output studies has led to a rapid growth in number of analyses. For a comprehensive survey of educational input-output analysis in the United States, see Cohn and the Others[2]; for survey of international comparisons, see Simmons[3]; and for a review of research in developing countries, see Simmons and Alexander.[4]

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1. James S. Coleman et. al., Equality of Educational Opportunity (Washington, D.C, U.S. Government Printing Office, 1966).
2. Elchanan Cohn, Stephen D. Millman and It-Keong Chew, Input-Output Analysis in Public Education, (Cambridge, Mass., : Ballinger, 1975), pp. 31-49.
3. John Simmons, How Effective is Schooling in Promoting Learning? A Review of the Research, International Bank for Reconstruction and Development, Staff Working Paper No. 200, (March 1975)
4. John Simmons and Leigh Alexander, The Determinants of School Achievement in Developing Countries : A Review of Research, The World Bank, (March 1976).

As economist entered this area, the relationships estimated became known as educational production functions. Samuel Bowles[1] pointed out that if education did have unique effect on labor productivity, it should be possible to relate the development of productive skills and allocation of scarce resources. The use of the concept of production function in educational production process helps establishing a more meaningful behavioral model and interpretation of the results. In setting school policy and in long-range educational planning, knowledge of educational production function is essential to efficient resource allocation. The theoretical concept of educational production function may be simple. There are, however, a serie of issues encountering researchers in attempting to estimate such relationships.

The conceptual problem begins with measurement of outputs. Outputs of schooling process could be multiple and, sometimes, interacting . Examples of schooling outputs are academic skill, political awareness, self-esteem, etc. A higher self-esteem may also improve scholastic achievement. If interaction exists, simultaneously bias will arise in the estimation of any single equation by the method of ordinary least squares.

Although modern study on education production tends to pay more attention to other measurements of outputs, the use of test scores as output measures still remains popular. Hanushek[2] has provided supporting arguments for the use of test scores as output measures. They are the most available and are also often been used to evaluate educational programs, and even to allocate funds. A more persuasive argument for the use of test scores relates to continuation in schooling. Test scores appear to have an increasing use in selecting individuals for further schooling.

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1. Samuel S. Bowles,"Towards an Educational Production Function in Education, Income and Human Capital, ed. W. Lee Hansen, Studies in Income and Wealth No. 35 (New York : National Bureau of Economic Research, 1970), pp.11-61.
2. Eric A. Hanushek, "Conceptual and Empirical Issues in the Estimation of Educational Production Functions," The Journal of Human Resources 14 (Summer, 1979) pp. 351-388.

Inputs in the educational production process can be broadly classified into school and nonschool factors. The school factors include both human and physical resources. The human inputs typically emphasized in studies of this nature include teachers, administrators, secretarial, etc. Since a large fraction of schools' budgets is spent on teaching staffs, much attention has been directed to the efficacy of teachers. This implies a need to examine various potential productive attributes of teachers, including educational preparation, experience, talents, attitudes, and classroom practices. The physical inputs include building characteristics, quantity and quality of equipment, and other supporting physical facilities.

The nonschool inputs include general home characteristics of students and general characteristics of community environments that could affect educational outcomes. The formers are parental socioeconomic status, races, sexes, family sizes, etc., and the latters refer to degrees of urbanization, extent of poverty, racial compositions, etc.

In attempting to evaluate the contribution of a given input to the output of a given student, it is often difficult to ascertain which portion of the input under discussion is relevant to the current investigation. In addition, there is a problem of accuracy of variable measurement. Individual and family characteristics are more in the form of stocks and, hence, are subject to less intertemporal variations than are school inputs. Thus, use of cross-section measurement of contemporaneous school factors clearly tends to underestimate the total effect of educational inputs on achievement. Another source of error of measurement is due to the aggregation of school inputs. Researchers frequently have information on individual students but information on schools are oftenly aggregate.[1]

Statistical estimations of empirical models frequently encountered the problem of multicollinearity. That is, there are high correlations among explanatory variables. The use of analysis of variance in the Coleman Report

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1. Hanushek (1979) provides a lengthy discussion on the problem of error of measurement of variables in the educational production function studies.

was criticized by Bowles and Levin[1] as an inappropriate methodology due to interdependence among the right hand side variable. The analysis of variance judges the significance of the influence of explanatory variables upon the academic achievement by the additional increase in the variance explained, R^2. If two variables are highly correlated, the first entered will be assigned both its unique contribution to explained variance and its jointly explained variance with the other variable. Consequently the variable that enters later will cause the overall R^2 to increase by negligible amount. Changing the order in which the variables are entered will change the proportion of explained variance attributed to each.

A more appropriate techinque of estimation as suggested by many researchers, for example Bowles (1970) and Hanushek (1979), is multiple regression analysis. This method is designed to take into account correlations among exogenous variables. If these variables are uncorrelated, simple regression will suffice. However, with very high levels of correlation among explanatory variables, the coefficients estimated become imprecise, i.e., their standard error of estimates will increase.[2] Another advantage of the use of multiple regression is that the value of the coefficients will be more relevant to policy purpose than the adding contribution of the explained variance of each independent variable.

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1. Samuel Bowles and Henry M. Levin, "The Determinants of Scholastic Achievement - An Appraisal of Some Recent Evidence", Journal of Human Resources 3 (Winter 1968), pp. 3-24.
2. Eric A. Hanushek and John E. Jackson, Statistical Method for Social Scientists (New York : Academic Press, 1977) pp. 133-137.

B. The General Conceptual Model

In our study of factors determining the academic achievement of students in the grade 3 and Mathayom Suksa 5, we will employ the following general model;

$$A_i = f(F_i, S_i, u_i)$$

That is the academic achievement of the ith student, A_i is determined by a vector of his or her family background characteristics, F_i, and a vector of variables describing the learning conditions in schools, S_i, and disturbance term, u_i.

The academic achievement of the grade 3 students under the study will be measured by their scores in the second test. For the MS 5 students, their academic achievement will be proxied by their grades in the final examination. A more detailed description on the dependent variables in these two studies will be presented in the section on data.

The vector of family characteristic variables includes students' own characteristics and family socioeconomic status. The former are varibles such as health condition, previous schooling, age, etc. The latter composes of father's occupations, parents' education, home locations, family sizes, numbers of siblings in school, exposure to media, absence records, textbook availability, etc. Various measurements of student's characteristics and home environment will be tried.

The vector of variables describing learning conditions at school or the school inputs composes of both school facilities and teacher characteristics. School variables are types, locations of school, sizes of school either measured by number of teachers or students, class sizes, student-teacher ratios, etc. Teachers' characteristics are measured by teachers' qualification, teachers' cognitive abilities, teachers' views of students' learning abilities, teachers' salaries, numbers of teaching years, teachers' attentiveness, etc.

Not all variables listed above are available in both sets of data. Since there is no a prior knowledge on either any specific list of determining variables or any functional form of the relationship. The "best" model in each study will have to be based on the results of statistical analyses.

C. Statistical Estimation Procedure

In order to evaluate the effect of educational inputs on the academic achievement, we employ "multiple regression analysis". The theory of educational production does not explicitly specify any functional form of the relationship. Most studies of this kind assume linear forms of relationship between outputs and inputs. However, the relationship between academic achievement and some variables may not linear. For example, there could be some economies of scale in class sizes or the effect of some inputs may depend on how much the other inputs are used. Therefore, various specifications of variables entering the model, such as polynomial forms or interaction among them, will be attempted.

In our conceptual model, we broadly classify inputs into two categories; namely family background and schooling characteristics. In estimating the effect of these variables, we shall run the equation twice. The block of variables in each category will take turn in entering the regression equation in the first step. Then, the remaining group of variable will be added in the second run. In so doing, we hypothsize that school characteristics do affect students' achievement as do family characteristics. If the school characteristic variables entered the regression equation prior to the family background variables, the estimated coefficient of the former should be significant. Due to high correlations among the two groups of variables, adding the latter in the second step will increase the standard error of the estimated coefficients of the school variables, and hence a decrease in the t-value pertaining to each variable. The adding contribution of the variance explained, or the increase in the numerical value of R^2, in the second step is expected to be low too. When the process of estimation is reversed, i,e. the family characteristics were introduced prior to the school variables, a result in the opposite direction is anticipated.

III. The Analysis of the Grade 3 Pupils' Scholastic Achievement

The Data

As has been mentioned previously, this set of data has generously been provided to us by the Office of the National Education Commission. The data were obtained from the na tional survey in 1973 for the purpose of study of primary schooling in Thailand, a joint project by the Office of the National Education Commission, Ministry of Interior and Ministry of Education.[1]

Our study utilized the set of data that contains detailed information of 1974 pupils from 987 schools. Two pupils were selected randomly from each school for interview on family background and home environment. Each observation contains 127 variables relating the pupil's socioeconomic background, own characteristics, schooling qualities and the scores on the achievement tests. The pupils were given two tests to measure what they knew when they entered and left grade 3. For our analysis, the scores on the second test will be used as the dependent variable.

The data were contained in two magnetic tapes. Due to some technical problem in merging these two tapes, we are able to use only the first tape. There are 804 pupils in three regions, the Bangkok Metropolis, the Central and the North. Some distributions of the pupils under our study are provided in the Appendix. The randomness of the sampling procedure should guarantee the unbiasedness of the sample utilized in our study.

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1. There are series of reports on general conditions of primary schooling in Thailand published jointly by these government agencies. For those who are interested in the distributions of sample in this survey, the details are contained in these reports.

Results of Statistical Estimation

Different Specifications of the statistical model of the scholastic achievement of the grade 3 pupils have been experimented. In an attempt to arrive at more significant estimates, we have eliminated from the regression equations these variables that yielded insignificant coefficients. We realized that by so doing we might introduce some specification error. However, there is very little a prior information on specific input variables or their measurements to be included in the model. We might as well commit similar error by including irrelevant explanatory variables into the regression equation.

Before proceeding to the statistical results, some discussion of variables in our final outcome seems appropriate.

The school inputs : Variables representing the school inputs are as follows :

The type of school : There are four types of schools providing primary education, private schools, Ministry of Education school (MOE), municipal schools and Changwat Authority Organization schools (CAO). These four types of schools are different from each other in characteristics and compositions of pupils. Private schools are urban, cater to relatively wealthy pupils, and have proportionately fewer trained teachers. MOE schools are urban and large, serve mainly middle class families, and have well-qualified teachers. Municipal schools are also urban, large, and reasonably well staffed. Provincial schools (CAO) are small. Pupils are drawn from rural families, and teachers are generally less well qualified. The inclusion of dummy variables for the "type of school" is to catch the effect of being in different types of schools on the academic achievement of pupils. By using the private school as a reference, the coefficient of the dummy variable of any type of school is the estimated difference in the academic performance of pupils in that type of school and the one in private schools.

The teachers' total test scores : This Variable measures the cognitive ability of teachers by their performance in five tests; they are mathematics, reading comprehension, verbal analogy, principle of education and methods of teaching, and education psychology. It could be regarded as a proxy for teachers' qualification and characteristics. The teachers' test scores variable is found

to be significantly determined by their age, degree qualification and formal education. (see table 8)

The teacher's view of the pupil's ability : Teachers as school inputs are usually related to classes or groups of pupils, not individual students. However, this variable pertains to individual pupils. It is represented by a set of dummy variables for the three possibilities; namely good, fair and poor.

Number of Classrooms : This variable is a proxy for the sizes of school. Among variables representing sizes of school; e.g. number of teachers, pupils, areas, the number of classrooms variable is found to have the highest correlation coefficient with the pupils' scholastic achievement.

The nonschool inputs

The pupils ages : It is observed that parents in urban areas or better educated parents are more likely to send their children to schools at younger ages than those in rural areas. The age variable reflects not only the maturity of the pupils, but also the parents' socioeconomic status as well.

The pupils' weights : This variable is taken as or proxy for the health condition of the pupils.

The pupils' absence records : This variable could also be used as another proxy for the parents' economic well-being. The children of the farmers or low income families families frequently have to help their parents on farm or stay at home to take care of younger relatives.

Having kindergarten education : This is abinary variable, coded 1 for pupil who has attended kindergarten and 0 otherwise. Again, this variable reflects the parents or home background similar to the age variable.

Grade repetition : This variable measures directly pupils' cognitive ability. Its negative effect on the pupils' academic achievement is very strong.

Father's occupation-farmer : This variable is a proxy for socioeconomic status of the family. It was found, in the NEC study, to have the strongest negative relationship with scholastic achievement.

Location of home-city municipality : The variable is a dummy coded 1 if the pupil lives in city or municipality and 0 otherwise. The location of home reflects the type of school available to children.

Exposure to television : Among different types of media, exposure to television shows strongest positive association with the academic achievement. This variable should also reflect the modernization of the community where the pupils live as well as their families' economic-well-being.

Distance from home to school : This is a continuous variable to measure the distance in kilometres from the pupil's residence to school. It measures the time cost of travelling. This variable should have negative effect on pupils' achievement.

The means and standard deviations of variables that appear in the final result are shown in table 7.

The Effect of School Inputs

Table 5 shows the result of statistical estimation when the school inputs enter the regression equation prior to the home inputs. The school inputs together explain 34 per cent of total variance in the academic achievement of grade 3 pupils. The F statistics indicates that their joint effect is statistically significant. All the estimated coefficients of the school variables have the right signs, and are significant at the .05 level. The difference between the average test scores of the grade 3 pupils in different type of public schools and those in the private schools (the omitted group) are as expected. Pupils in the CAO schools are found to be the poorest group, next are those in the municipal schools and in the MOE schools respectively. However, after other school variables and the pupils' family background are controlled for, the magnitude of the differences are reduced but are still statistically significant. These remaining differences could attribute to the management efficiency of private schools. If academic achievement is to be a goal of educational policy, it is most interesting to find out how private schools manage to come out best despite their relatively poor composition of high qualification teachers.

The teachers' total test score variable exerts a strong positive effect on the pupils' test scores. This should not be surprising since the teachers' tests cover both the teaching and academic ability. Teachers with high qualification do not necessarily possess better teaching ability. This explains why teachers' qualification exerts low influence on pupils' academic achievement.

The number of classrooms in each school is regarded as a variable that measures the sizes of schools. This is a catch-all variable that includes the effect of numbers of students, teachers, teaching areas, and management sizes. It also exerts positive and highly significant effect on pupils' academic achievement.

Teachers are supposed to know their pupils' cognitive ability. As expected, the group of those who are viewed "good" perform significantly better than those who are viewed "fair" which are still better than "poor". The important implication of this variable should be that teachers' personal interest in pupils could help improving the learning condition of the pupils.

In the second step, we enter the set of nonschool variables. All the coefficients of the school variables remain significant and their signs remain unchanged. The variance explained is increased by .07 which is relatively small. This is due to high correlations among variables representing the school and nonschool inputs. However, the opposite result occurs when these variables enter in the first step, as shown in Table 6. All the nonschool inputs in the equation account for about 36 per cent of the variation in the grade 3 pupils' achievement. It should be noted that the father occupation-being farmer, is significant when there is no control for the school inputs. However, its effect turns to be insignificant when the school inputs are controlled for, see table 6. This is not surprising since this variable is highly correlated with the school variables. The correlation coefficients of this variable with the dummy for the CAO school, and with the number of classrooms are 0.642 and - 0.401 respectively.

Almost all coefficients of the nonschool variables, except the pupils' weights, are statistically significant and have the right signs. The general result is in line with the findings of the NBC study.

When the school variables are entered the regression equation in the second step, the increase in the numerical value of R^2 due to addition of these variables is only .008. See table 7. To test the hypothesis of the joint influence of these added variables, we utilize F-statistics. The calculated F statistics is 3.36. From the F-distribution, for the degree of freedom 3, 1205, it is significant at the .05 level. We may, therefore, conclude that despite the high correlations among the two sets of variables, the school variables significantly contribute to the increase in variance explained. This conclusion

deviates somewhat from the NEC findings on the effect of schooling variables.

Concluding Comments

From our reanalysis of the Grade 3 pupils'achievement, the following conclusions are drawn :

1. Due to high correlations among school and home background variables, the value of R^2 is highly sensitive to the order in which the variables enter the regression equations. Consequently, stepwise regressions could produce a misleading interpretation of the influence of the school inputs on the pupils' achievement.

2. Some standard indices of school quality such as teacher-pupil ratio and space per pupil are too aggregate to exert any direct influence on the achievement of individual pupils.

3. The teachers' credentials or qualification could explain partly their ability. Teachers who have acquired bachalor's degrees for a long time and do not keep up with progress in new teaching technology may contribute less to the pupils' achievement than those who have just completed the High Paw Kaw Saw. This explains why the variation in the teachers' total test scores perform better than teachers' qualification in explaining the variation in the pupils' achievement.

4. The Difference in the types of schools that the pupils attend causes a large difference in the pupils' test scores. Despite lower proportion of teachers with high Paw Kaw Saw and above, the private schools' pupils perform significantly better than pupils in all public schools. At present there is a tendency for the government to provide all the primary education since it is compulsory. A further study on the difference on management efficiency between private and public schools is strongly suggested. Of academic achievement is to be a goal of the education policy and of private schools can do better, the private sector should not be withered by the government expansion. The government should choose to subsidize the poor pupils in private schools instead.

5. Our findings indicate clearly that children in large urban areas have higher achievement level than those in rural areas. The advantage of urban children are due to their accessibility to kindergarten and better-quality primary schools. Moreover, they are more exposed to modern media like television than rural children.

6. Although the fathers' occupation as farmer does not exert significant negative effect on the achievement in the final step, it does not mean that our result is in conflict with the NEC findings. On the contrary, it shows more clearly that the disadvantage of the farmers' children lies in the fact that they go to schools of poorest quality. The findings inevitably lead us to suggest that to lower the gap in the achievement level between rural and urban children, more investment to improve the quality of schooling in the rural area, the CAO schools, is required. Since distance between schools and residences exert negative significant effect on the achievement, either more schools should be built or more transportation should be made available to children who live far from schools. Teachers' quality at the primary level could be improved, not necessary by continuing to higher qualification level, but by exposure to new teaching techniques and improving the internal management efficiency of various schools.

IV. The Analysis of the MS 5 Students' Scholastic Achievement

The Data

Two sets of data were utilized for the analysis of the academic achievement of MS 5 students.

The first set of data collected from our questionaires distributed to the 1977 first year students in various institutions of higher education, both public and private. The public institutions are various universities - Chulalongkorn, Kasetsart, Thammasat, Mahidol, Silpakorn, King Mongkut's Institute of Technology, Chiangmai, Khon Kaen, Songkla and Ramkamhaeng. The private institutions are Bangkok College, Business College (Thurakij Bundit), Chamber of Commerce College and Phayub Technical College (in Chiangmai). The questionaire was designed to get information on the students' academic performances in Mathayom Suksa 3 and Mathayom Suksa 5 as well as their general school environment. Information on students' characteristics and home environments were also collected. Total number of MS 5 students in the year 1976 were 68,325. Of these, 54,852 students were in public schools and 13,469 were in private schools. Our survey covered approximately 5 per cent of total MS 5 pupils.

The academic year of 1976 was the first year that the final exam has changed from the system administered by the Ministry of Education to the one administered by individual school. It could be criticized about the comparability of the results among schools. However, for a small project like this one, it is impossible to carry out a nationwide standardized test. We have carefully checked with many officials in the Educational Techniques Department, Ministry of Education, about variation in standard among schools. We were informed that since it was the first year, there was not much variation in curriculum and textbooks among schools. Besides, schools having upper secondary education have been supervised by the Department to cluster among themselves in order to promote educational standards and improve methods of instruction, evaluation and guidance. Therefore, at least within each cluster, examination instruments

are likely to be similar.[1] In addition, for the group of the 1976 MS 5 graduates, their MS 3 final examination was standardized and administered by the Ministry of Education. We select only students who completed MS 5 level in academic stream and final the correlation of their MS 5 and MS 3 grades. The correlation coefficient is 0.3296. For a sample size of 1204, it is significant at the .01 level.[2] This indicates that there is a close relationship between the performances in both level. We may, therefore, conclude that there are certain degree of standardization inherent in the MS 5 grading although if was independently administered by individual school.

The dependent variable in our model of the MS 5 scholastic achievement will be the MS 5 GPA (grade point average) of students in our sample.

The second set of data provides information on school pertaining to each student in our sample. They were obtained from the annual report of schools all over the country collected by the Ministry of Education. The report contains the following information :

a. Information on students such as total number of students in school classified by class, number of repeaters, drop-outs, etc.

b. Information on school financing such as tuition fee, value of things and money received from donation,revenue from tuition and other fees, expenditures by categories, etc.

c. Information on teachers such as number of teachers classified by sex, age, marital status, number of years of teaching, highest education completed, teaching load, salary, etc.

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1. for those who are interested in the examination system in Thailand,see Kamol Sudaprasert, "Examination System Reform : A Case Study of Thailand" Bureau for Testing Services, Department of Educational Techniques, Ministry of Education, January, 1977 (mimeograph)

2. $t_{1202} = 12.103$

Some Distribution of the MS 5 Sample

Types of MS 5 School

As mentioned previously, we collect information on MS 5 grades by distributing questionaires to first year college students. It is therefore possible that these students might have not completed MS 5 level in the same year. Moreover, some of them might have attended vocational schools or not gone through any formal school systems. In order to make the students in our sample in as much comparable condition as possible, we confine our analysis to those who finished MS 5 in the academic year 1976 from schools in the formal school system. In so doing our sample size is reduced from 2,670 students to 1,561 students (see tables 10 and 11). Strikingly, the percentage of students from private schools is reduced from 20.6 to 1.34.

Fathers' Occupation and Institute of Higher Education

Table 12 presents the distribution of students in different institutions by their fathers' occupations. The students whose fathers are sales workers form the largest group, about 38 per cent of total students in our sample. Next are children of the professional, 13.7 per cent, the administrative 12.4 per cent, the farmers 10.3 per cent. Approximately 46 per cent of students in our sample were enrolled outside the "closed" university system. Of which about 40 per cent were in Ramkamhaeng University. Of all 161 farmers' children enrolled in higher institutions, 103 or 64 per cent were in Ramkamhaeng University which constitute 16.6 per cent of total Ramkamhaeng's students in our sample.

Age Sex and Race

About 90 per cent of students in our sample are in the age group of 17-19 years old. The largest group, 46 per cent, is the group in the 18 years of age. The proportion of male-female is 1.4 : 1 . Students of Chinese race constitute 18.2 per cent of total students in our sample. (see Table 13)

The MS 5 Grades and Higher Institutions

In order to see the relationship between the MS 5 grade and the chance of passing the university entrance examination, we crosstabulate students by their grade point average (GPA) and higher institutions attended. See Table 14. The last two columns show the percentage of students with GPA 2.49 or below, and 2.50 or above in each institution. The percentage of students with GPA 2.50 or above in the "closed" universities ranges from 65.2 (for Songkla) to 92.7 (for Mahidol). In Ramkamhaeng, about 60 per cent of students obtained GPA 2.49 or below. The proportion of students in the three private colleges with GPA 2.49 or below, ranging from 61 per cent for Bangkok College to 90 per cent for Chamber of Commerce. The composition of students in Phayub College is an exception. However, the sample size of this institution is too small to be statistically meaningful.

The Students' MS 5 Grades and Fathers' Occupation

The socioeconomic status of fathers is another factor that influences the students' academic achievement. Table 15 presents the distribution of of students' MS 5 grades by fathers' occupations. In order to see more clearly the relationship between these two variables we calculate the percentages of students with GPA below 2.50 and those with GPA above 2.99 for each fathers' occupation category, see columns 8 and 9 in table 15. The data indicate that the pe r centage of the farmers' children with GPA below 2.50 is the biggest, 53.7 per cent of total farmers' children. Next are the children of the laborers, 48.9 per cent. If we exclude the group of service workers due to very small sample size (8 persons), the percentage of the sales workers' children who obtained GPA higher than 2.99 is the biggest, 23.9 per cent. Next are children of the professonals, 19.8 per cent. The percentage distribution of the remaining group are very similar to each other.

The Students' MS 5 Grades and Mothers' Education

Human capital theorists believe that education of mothers is one important factor that influences their children's learning motivation. Columns (4) and (9)

in table 16 show the percentage distribution across mothers' education of two groups of students, those with GPA less than 2.00 and those with GPA 3.00 or above. For the low achievers, see column (4), we can see that the proportion tends to decline as the level of educational attainment of mothers increases. For the high achievers the opposite trend is found, see column (9). However, it is not possible to state conclusively about the influence of mothers' education on scholastic achievement without more detailed observation and analysis.

Regional Variation in the MS 5 Grades

Since the 1976 final examinations for MS 5 students were carried out directly by individual schools, it would be of interest to how grade distribution varies among students in different regions. As is shown in Table 17, the largest group of students in every region are those who obtained GPA between 2.50-2.99. Since the largest number of students in our sample completed MS 5 level in Bangkok, the grade distribution of students in the Bangkok region resembles the national distribution. The percentage of students who obtained GPA less than 1.49 is highest in the Northeast, 4.4 per cent. However, the percentage of students obtaining GPA 3.50 and above is also the highest in the Northeast, 6.7 per cent. The South is the region that has the lowest percentage of students with GPA 3.00 or above. Not much can be said about the pattern of variation among students in different regions until other factors such as schools and teachers are taken into account.

Results of Statistical Analysis

In estimating the regression equations for the MS 5 grade we encounter a problem of severe multicollinearity. After eliminating variables that are highly correlated, our final equation contains the following variables :

The School Variables

Class sizes This variable is derived from dividing total number of MS 5 students in each school by number of MS 5 classrooms. The data are obtained from

the school annual reports.

Average teacher salaries : Normally, students at this level have to take various courses with different teachers. The school annual reports do not identify the techers who taught at the MS 5 level. From the correlation coefficient matrix, we found that the teachers' characteristic variables are highly correlated with each others. However, the correlation between the average teacher salary and the MS 5 grade is the highest. We, therefore, use the average teacher salary as a proxy for teachers' characteristics. The average teacher salary is obtained from dividing total teachers' salaries by number of teachers in school. In order to check whether the average teacher salary is a good proxy for teachers' characteristics, we run a regression equation of the determinants of average teacher salary. The explanatory variables are average teacher ages, average number of teching years in this school, average hours of teaching per week and proportion of teachers with bechalor degrees or above. The result of the estimation supports the use of average teacher salary as a proxy for teachers' characteristics. See table 18.

Teachers' disattentiveness: This variable intends to measure the teacher input based on students' attitude. Information for this variable is obtained from our questionaires. It was coded as follows :

1. very good
2. good
3. not too bad
4. bad

From the way it was coded, this variable is expected to associate negatively with the MS 5 GPA.

The Home Environment and Students' Characteristics

Number of siblings in school This variable should measure the learning atmosphere at home. It should be positively associated with the MS 5 GPA. It is a continuous variable obtaining from the questionaires.

Mothers' education This variable is also obtained from the questionaires. It is coded as follows :

1. Illiterate
2. Able to read and write
3. Complete primary education
4. Complete lower secondary education
5. Complete upper secondary education
6. Certificate
7. Not complete B.A.
8. B.A.
9. M.A.
10. Ph.D

Grade repetition This is a dummy variable coded one if the student has ever repeated any grade, or zero otherwise. Since this measures the students' cognitive ability, it should be positively associated with their GPA.

Health condition This is an ordinal variable coded as follows :

1. poor
2. not too bad
3. good

Poor health condition should retard students' learning capability.

The results of statistical estimation are shown in table 19 and table 20. Table 19 presents the regression equations with home inputs entering first and school inputs follow; and table 20 presents the regression equations with the reversed order of entering of variables. The sign of the coefficients of all variables turn out be as expected. The education of mothers is found to be statistically insignificant at the conventional level. The variable that exerts the strongest negative effect on the students' GPA is the grade repetition. This is consistent with that of the grade 3 level. The students' health condition is also very important. The class size and the average teacher salary are found to be statistically significant, but the magnitude of the effects are negligible.

The value of R^{-2} in the final step is rather low, o.o38. However, the F statistics in the final step is shown to be statistically significant, implying that the explanaroty variables jointly contribute to the explanation of variation in the students' GPA. The calculated F statistics for testing the additional contribution of the home environment and students' characteristics in table 19 is 8.82, and the F-statistics for testing the additional contribution of the school variables in table 20 is 3.36. The former is statistically significant at the .01 level and the latter at the .05 level.

Concluding Comments

The empirical results may seem unsatisfactory in the sense that only few variables appear to be statistically significant and the overall value of R^{-2} is relatively low. Besides the problem of severe multicollinearity among variables, there are problems of not enough variations in the sample. At least three following possible sources that lower the variation in the sample could be identified :

First, at the higher level of education students tend to be more homogeneous in cognitive ability as well as in family background. According to statistics on education in Thailand in 1976, about 64.3 per cent of all students were enrolled in the lower primary level, 20 per cent in the upper primary, and less than 2 per cent in the upper secondary enducation.[1] This indicates clearly that a large number of students are forced to leave the formal school system at each major level of education due to parents' inadequate financial support. Those who realize their inability to attend the university level will turn to vocational training. The upper general secondary education is mainly for those who intend to go on to higher education. Since our sample is composed only of students who have completed the upper general secondary education, there are less variation in their cognitive ability and their family socioeconomic status.

Second, schools that provide education at this level are mostly big schools and located mainly in large urban areas. Variation in quality among schools at this level is expected to be less than schools at the primary level. Furthermore, about 60 per cent of students in our sample came from schools in Bangkok. This could further reduce variation in schooling factors among students.

Third, the final examination for the MS 5 students in the year of our study was independently administered by individual schools. It is very likely that variation in the students' GPA among schools under this system is much less than the previous examination system administered by the Ministry of Education.

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1. Office of the Prime Minister, National Statistical Office, 1976 Statistics on Academic Stream of Education by Province, Bangkok 1976, p. 19.

Consequently, the variation in the dependent variable in our model is smaller than it should.be.

The multiple regression techinque is designed to explain variation in the dependent variable by variation in the explanatory variables. If the variation in the dependent variable is small, a low value of R^2 will turn up. When the variation in the explanatory variables are small, the standard error of estimates of the coefficients will be high. As a consequence, many coefficients could turn to be insignificant.

Despite the nature of the data and the problem of multicollinearity, our findings are still considered useful. It confirms that to be able to highly achieve in study at this level, students' cognitive ability and health conditinn are very important. Students who have ever repeated any grades and have poor health will be in much disadvantageous position at the higher level of education. Classrooms of larger sizes also exerts adverse effect on students' learning condition. The effect of teachers' salaries should not be interpreted straightforwardly, but should be related to teachers' characteristics variables. Teachers' salaries should be in creased in concomitant with teachers' experience, qualification and appropriate teaching loads.

V. Summary of Findings and Their Implication

In this study, we attempted to investigate the distribution of education, measured by students' cognitive ability, and factors determining it. We are also interested in finding out the consistancy, if any, of the influences of these factors from lower to higher level of education. The conceptual framework of educational production function was employed. Students' scholastic achievement, measured by their test scores, was taken as the only educational outcome.

Due to time and budgetary constraints, our snalysis was confined to the lower primary and the upper secondary levels. At the lower primary level, we analyzed the scholastic achievement of grade 3 pupils using the data tapes on the sample of the grade 3 pupils made available by the National Education Commission. The analysis at the upper secondary level was based on our own survey of the Mathayom Suksa 5 (MS 5) students. The samples were drawn from some first year college students in various institutions of higher education, both public and private. Information on school inputs pertaining to each student was obtained from the annual reports submitted to the Ministry of Education by schools all over the country.

At the lower primary level, many factors measuring the parents' socioeconomic status and pupils' own characteristic were found to affect significantly the pupils' scholastic achievement. However, these factors were highly correlated with the school inputs. When school inputs were controlled for, some socioeconomic variable, in particular the occupation of father, turned out to be statistically insignificant. This should not be surprising since the type of school attended by the children reflected their family background clearly. The only type of school accessible by farmers' children in the villages are the CAO schools. The quality of these schools are the lowest among all types of school. The analysis shows clearly that the average scholastic achievement of pupils in private and MOE schools were significantly above those in the CAO schools. Pupils who had been to kindergarten schools also performed better than those who had not. These schools; the private, the MOE and the kindergarten, are accessible only by children living in municipal areas.

Despite the problem high correlation among school and nonschool variables, it was shown that an increase in the variance explained due to

adding of school input variables into the regression equation was statistically significant. Teachers' cognitive skills, measured by their cognitive test scores, determined significantly the pupils' sholastic achievement. These teachers' cognitive skills were in turn affted by their qualifications, ages and formal education.

The progression of pupils, in the Thai educational system, to higher educational level are determined almost entirely on their performances in the examinations. These examinations emphasize heavily the cognitive ability of students. Furthermore, almost all public school and some good private schools employ competitive entrance exams to select new students. As a consequence, students who survive through higher educationsl level are relatively homogeneous in cognitive ability and in family socioeconomic background.

Because of the problems of severe multicollinearity and not enough variation in the sample, not many variables showed up to be statistically significant in the final regression equation for the scholastic achievement of MS 5 students. The variable that consistently exerted negative effect on the achievement of the Grade 3 pupils and the MS 5 students was the repetition of students in any grade level. Class size and average teacher salary were also significant determinants of the MS 5 students' scholastic achievement.

Due to more homogeneity of students at the higher level of education, traditional socioeconomic variables do not show up to be statistically significant in the regression equation for the MS 5 scholastic achievement.

The findings of the study imply that the inequalities in scholastic achievement at the lower level of education resulted in eliminating the low achievers out of the formal school system. These low achievers are mostly children of the farmers who went to poor-quality schools at the lower primary level. The survivors of the system are the children of families with higher socioeconomic status in large urban areas where schools of good quality are numerous.

Scholastic achievement of pupils could be improved through the improvement of schooling inputs. Various measures to improve teachers' cognitive skills, in addition to upgrading of qualification, should be invented. This may necessarily involve improvement in administration in public schools particularly the CAO schools.

A P P E N D I X

Table 1 Distribution of Grade 3 Pupils by Type of School, and Test Scores

Type of School	Test Scores		Number of pupils
	Mean	Standard Deviation	
Private	78.2	20.9	159
MOE	83.0	18.5	64
Municipal	67.5	20.1	115
CAO	50.6	20.8	466
	61.1	24.2	804

Source : Data Tape of Grade 3 pupils, Office of the National Education Commission.

Table 2 Distribution of Grade 3 Pupils by Regions and Test Scores

Region	Test Scores		Number of pupils
	Mean	Standard Deviation	
Bangkok	77.3	23.1	239
Central	57.6	21.1	337
North	49.2	20.5	228
	61.1	24.2	804

Source : Data Tape of Grade 3 pupils, Office of the National Education Commission .

Table 3 Distribution of Grade 3 Pupils by Occupation of Father and Test Scores

Occupation of Father	Test Scores		Number of pupils
	Mean	Standard Deviation	
Agriculture	49.7	20.0	384
Services	69.4	24.8	123
Merchant	73.7	22.5	140
Industrial Work	65.7	19.5	21
Government Officer	75.5	21.8	90
Professional	80.3	25.3	7
Others and no response	62.4	21.0	39
	61.1	24.2	804

Source : Data Tape of Grade 3 pupils, Office of the National Education Commission.

Table 4 Distribution of Grade 3 Pupils by Location of Residence and Test Scores

Location of Residence	Test Scores		Number of Pupils
	Mean	Standard Deviation	
City Municipality	80.8	21.0	173
Town Municipality	70.8	20.23	87
District Municipality	61.8	17.3	24
Sanitary Municipality	62.6	25.4	65
Outside Sanitary Area	51.2	20.7	447
Not Specified	62.5	16.5	8
	61.1	24.2	804

Source : Data Tape of Grade 3 pupils, Office of the National Education Commission.

Table 5 Regression Equations for Grade 3 Achievement with School Inputs Enter Prior to Home Inputs

Explanatory Variables	Estimated Coefficient	t - value	Estimated Coefficient	t - value
Type of School				
- MOE	-8.913	-2.419*	-5.930	-1.647*
- Municipal	-14.770	-5.269**	-10.173	-3.554**
- CAO	-27.96	-11.956**	-15.159	-5.130**
Teacher's total test scores	0.215	4.298**	0.158	3.253**
Number of Classrooms	0.399	4.317**	0.231	2.496*
Teacher's View of Pupil's ability				
- good	5.464	2.544**	4.431	2.126*
- poor	-6.843	-2.359*	-6.493	-2.331*
Pupil's Age			-1.260	-1.835*
Pupil's Weight			0.172	0.884
Pupil's Absence Record			-0.213	-2.868**
Attended Kindergarten			4.821	2.182*
Repeat Any Grade			-5.976	-3.362**
Father Being Farmer			-0.590	-0.295
Home in Municipality			6.835	2.915**
Exposed to Television			6.401	3.554**
Distance from Home to School (Kilometre)			-0.250	-1.725*
Constant	64.831	-	65.159	-
R^2	0.347		0.413	
$\bar{R}^2$	0.340		0.399	
F	52.206		29.892	
n	698		698	

* Statistically significant at the .05 level .

** Statistically significant at the .01 level .

Table 6 Regression Equations for Grade 3 Achievement with Home Inputs Enter Prior to School Inputs

Explanatory Variable	Estimated Coefficient	t - value	Estimated Coefficient	t - value
Type of School				
- NOE			-5.930	-1.647*
- Municipal			-10.173	-3.554**
- SAO			-15.159	-5.130**
Teacher's Total Scores			0.158	3.253**
Number of Classrooms			0.231	2.496*
Teacher's View of Pupil's Ability				
- Good			4.431	2.126*
- Poor			-6.493	-2.331*
Pupil's Age	-1.502	-2.143*	-1.260	-1.835
Pupil's Weight	0.287	1.455	0.172	0.884
Pupil's Absence Record	-2.264	-3.443**	-0.213	-2.868**
Attended Kindergarten	10.433	5.020**	4.821	2.182*
Repeat Any Grade	-6.368	-3.473**	-5.976	-3.362**
Father Being Farmer	-4.189	-2.193*	-5.590	-0.295
Home in Municipality	12.257	5.722**	6.835	2.915**
Exposed to Television	9.027	4.988**	6.401	3.554**
Distance from Home to School	-0.352	-2.388*	-0.250	-1.725*
Constant	62.679	-	65.159	-
R^2	0.364		0.413	
$\bar{R}^2$	0.356		0.399	
F	43.729		29.892	
n	698		698	

* Statistically significant at the .05 level .

** Statistically significant at the .01 level .

Table 7 Mean and Standard Deviation of Variable in the Grade 3 Achievement Equations

Variables	Mean	Standard Deviation
Pupil's Scores	60.122	23.733
Type of School*		
- Net	0.086	0.281
- Municipal	0.153	0.361
- Ban	0.638	0.481
Teacher's Total Scores	54.557	15.028
Number of Classrooms	10.481	10.481
Teacher's View of Pupil's Ability*		
- Good	0.138	0.345
- Poor	0.073	0.260
Pupil's Age	9.053	1.226
Pupil's Weight	24.658	4.044
Pupil's Absence Record	5.486	9.691
Attended Kindergarten*	0.195	0.396
Repeat Any Grade*	0.234	0.423
Father Being Farmer*	0.510	0.500
Living in Municipality*	0.192	0.394
Having T.V. at Home*	0.593	0.492
Distance from Home to School	1.973	5.186

* being dummy variable

Table 8 Regression Equation for Teacher's Test Scores

Explanatory Variable	Estimated Coefficient	t - value
Teacher's Age	- 1.699	- 6.083**
Teacher's Qualification		
- Paw Kaw Saw	7.688	6.433**
- High Paw Kaw Saw	14.997	13.396**
- Bechalor Degree or Above	27.452	8.657**
Teacher's Formal Education	1.413	4.585**
Constant	44.050	-
$\bar{R}^2$	0.421	
F	102.220	
n	698	

**Statistically Significant at the .01 level.

Table 9

Matrix of Correlation Coefficients of Variables in the Grade 3 Pupil Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	1.00											
2	0.35	1.00										
3	0.29	-0.12	1.00									
4	0.14	-0.16	-0.13	1.00								
5	-0.51	-0.49	-0.40	-0.57	1.00							
6	0.18	-0.02	0.15	-0.02	-0.06	1.00						
7	0.40	0.05	0.59	0.16	-0.49	0.15	1.00					
8	0.14	0.64	-0.01	0.06	-0.08	0.03	0.08	1.00				
9	-0.16	-0.08	-0.09	-0.13	0.20	0.12	-0.12	-0.11	1.00			
10	0.01	-0.07	0.14	0.05	-0.07	0.05	0.06	0.07	-0.02	1.00		
11	-0.22	-0.13	-0.07	-0.06	0.17	-0.05	-0.12	-0.06	0.04	0.08	1.00	
12	-0.23	-0.13	-0.09	-0.14	0.25	-0.12	-0.24	0.03	0.07	0.05	0.08	1.00
13	0.40	0.38	0.35	-0.03	-0.44	0.12	0.33	0.12	-0.14	-0.00	-0.14	-0.15
14	-0.25	-0.13	-0.06	-0.05	0.16	-0.03	-0.12	-0.05	-0.01	0.17	0.17	0.06
15	-0.43	-0.35	-0.24	-0.35	0.64	-0.12	-0.40	-0.13	0.17	-0.02	0.13	0.24
16	-0.27	-0.23	-0.13	-0.01	0.24	-0.09	-0.11	0.02	0.03	0.38	0.15	0.15
17	0.43	0.32	0.33	0.29	-0.63	0.66	0.44	0.05	-0.12	0.07	-0.09	-0.16
18	0.44	0.25	0.25	0.26	-0.51	0.15	0.39	0.11	-0.11	0.01	-0.15	-0.29

Table 9 (Cont.)

Matrix of Correlation Coefficients of Variables in the Grade 3 Pupil Sample

Variable	13	14	15	16	17	18						
13	1.00											
14	-0.10	1.00										
15	-0.43	0.16	1.00									
16	-0.28	0.32	0.23	1.00								
17	0.31	-0.13	-0.48	-0.19	1.00							
18	0.30	-0.20	-0.54	-0.19	0.37	1.00						

List of Variables

1. Test Scores
2. Private School
3. MOE School
4. Municipal School
5. CAO School
6. Teachers' Total Scores
7. Number of classrooms
8. Teachers' View of pupils' ability-good
9. Teachers' View of pupils' ability-poor
10. Pupil's weight
11. Pupil's Absent record
12. Distance from Home to School (Kilometers)
13. Attended Kindergarten
14. Repeat Any grade
15. Father's Occupation; Farmer
16. Pupils' Age
17. Home Location municipality
18. Exposure to Television

Table 10 Distribution of Students by Institutions and Type of MS.5 School

Institution	Total	Public School		Private School	
		Number	%	Number	%
Chula	180	144	80.0	36	20.0
Kasetsart	228	185	81.1	43	18.9
Mahidol	70	66	94.3	4	5.7
Thammasat	327	250	76.5	77	23.5
Ramkamhaeng	1,037	871	84.0	166	16.0
Silpakorn	73	48	65.8	25	34.2
Chiangmai	223	185	83.0	38	17.0
Songkla	58	55	94.8	3	5.2
Khon-Kaen	59	52	88.1	7	11.8
King Mongut's Inst.	104	83	79.8	21	20.2
Bangkok College	70	56	80.0	14	20.0
Thurakij Bundit	109	60	55.0	49	45.0
Chamber of Commerce	53	36	67.9	17	32.1
Phayab College	79	30	38.0	49	62.0
Total	2,670	2,121	79.4	549	20.6

Table 11 Distribution of Students by Institutions and Type of M8.5 school (the 1976 graduates in the academic stream from the formal school system)

Institution	Total	Public School		Private School	
		Number	%	Number	%
Chula	142	132	93.0	10	7.0
Kasetsart	157	157	100.0	0	0.0
Mahidol	52	52	100.0	0	0.0
Thammasat	149	149	100.0	0	0.0
Ramkamhaeng	619	616	99.5	3	
Silpakorn	56	56	100.0	0	0.0
Chiangmai	165	159	96.4	6	0.0
Songkla	24	22	91.7	2	0.0
Khon-Kaen	34	34	100.0	0	0.0
King's Mongut Inst.	58	58	100.0	0	0.0
Bangkok College	27	27	100.0	0	0.0
Thurakij Bundit	36	36	100.0	0	0.0
Chamber of Commerce	23	23	100.0	0	0.0
Phayab College	19	19	100.0	0	0.0
Total	1,561	1,540	98.7	21	1.34

Table 12 Distribution of Students by Institutions and Father's Occupation

Father's Occupation / Institution	Total	Professional	Administrative	Clerical	Salesman	Farmers
Chula	142	12	20	6	76	4
Kasetsart	157	18	19	6	69	14
Mahidol	52	6	4	1	29	4
Thammasat	149	12	17	5	72	10
Ramkamhaeng	620	101	81	29	161	103
Silpakorn	56	7	9	4	14	5
Chiangmai	165	33	18	6	70	10
Songkla	24	3	1	0	17	0
Kon-kaen	34	5	0	1	18	4
King Mongut's Inst.	58	5	7	2	28	1
Bangkok College	27	5	4	1	11	0
Thurakij-Bundit	36	4	6	1	16	3
Chamber of Commerce	23	0	7	0	8	0
Phayab College	19	3	1	1	7	3
Total	1,562	214	194	63	596	161
(%)	100	13.7	12.4	4.0	38.2	10.3

Table 12 Distribution of Students by Institutions and Father's Occupation (Cont.)

Father's Occupation / Institution	Transportation	Craftsmen	Services	Laborer	Unclassified and no respon
Chula	2	5	3	7	7
Kasetsart	4	9	0	6	12
Mahidol	0	2	1	1	4
Thammasat	2	6	1	5	19
Ramkamhaeng	22	22	3	22	76
Silpakorn	9	0	0	1	7
Chiangmai	4	4	0	3	17
Songkla	1	0	0	0	2
Kon-kaen	0	0	0	1	5
King Mongut's Inst.	2	2	1	2	8
Bangkok College	0	0	0	1	5
Thurakij-Bundit	3	0	0	0	3
Chamber of Commerce	0	1	0	0	7
Phayab College	2	0	0	1	1
Total	51	51	9	50	173
(%)	3.3	3.3	0.6	3.2	11.0

Table 13 Distribution of Students by Age, Sex and Race

	Total	Male				Female			
		Total	Thai	Chinese	Other	Total	Thai	Chinese	Other
Age									
less than 17	56	34	32	2	0	22	17	5	0
17	319	226	196	30	0	93	74	19	0
18	709	425	357	66	2	284	221	63	0
19	380	187	154	32	1	193	150	43	0
20	70	28	25	3	0	42	27	15	0
21	12	2	2	0	0	10	7	3	0
22 and over	12	4	4	0	0	7	5	2	0
Total	1,558	906	770	133	3	652	502	150	0

Table 14 Distribution of Student By Institution and MS.5 Grade

	Total	less than 1.49	1.50-1.99	2.00-2.49	2.50-2.99
Chula	133	0	2	34	49
Kasetsart	140	1	3	29	65
Mahidol	41	0	0	3	15
Thammasat	136	1	1	33	61
Ramkamhaeng	545	16	68	241	184
Silpakorn	55	0	1	10	27
Chiangmai	150	1	3	28	67
Songkla	23	0	1	7	5
Khon-kaen	33	1	2	6	19
King's Mongut	55	0	2	15	27
Bangkok College	23	0	4	10	8
Thurakij Bundit	29	1	6	14	6
Chamber of Commerce	20	2	7	9	2
Phayab College	17	0	0	6	8
Total	1400	23	100	445	543
(%)	100	1.6	7.1	31.8	38.8

Table 14 Distribution of Student By Institution And MS.5 Grade

(Cont.)

	3.00-3.49	3.50-4.00	2.49 or below (%)	2.50 or above (%)
Chula	38	10	27.0	73.0
Kasetsart	35	7	23.6	76.4
Mahidol	20	3	7.3	92.7
Thammasat	34	6	25.7	74.3
Ramkamhaeng	31	5	59.6	40.4
Silpakorn	16	1	20.0	80.0
Chiangmai	40	11	21.3	78.7
Songkla	7	3	34.8	65.2
Khon-kaen	4	1	27.3	72.7
King's Mongut	8	3	30.9	69.1
Bangkok Col	1	0	60.9	39.1
Thurakij Bundit	2	0	72.4	27.6
Chamber of Commerce	0	0	90.0	10.0
Phayab Col.	3	0	35.3	64.7
Total	239	50		
(%)	17.1	3.6		

Table 15 Distribution of Students by Father's Occupation and MS.5 Gra

	Total (1)	Less than 1.49 (2)	1.50-1.99 (3)	2.00-2.49 (4)	2.50-2.99 (5)
Professional	197	2	18	65	73
Administrative	180	1	13	52	80
Clerical	57	1	5	18	22
Sales	543	15	33	156	209
Farmers	149	4	14	52	52
Transportation	43	1	4	12	18
Craftsman	48	0	8	12	21
Services	8	0	0	2	3
Laborers	47	3	3	17	15
Unclassified and No Response	156	3	6	63	61
Total	1428	30	104	449	554

Table 15 Distribution of Students by Father's Occupation and MS.5 Gra

(Cont.)

	3.00-3.49 (6)	3.50-4.00 (7)	$\frac{(2)+(3)+(4)}{(1)}$ (8)*	$\frac{(6)+(7)}{(1)}$ (9)*
Professional	29	10	43.1	19.8
Administrative	27	7	36.7	18.9
Clerical	9	2	42.1	19.3
Sales	110	20	37.6	23.9
Farmers	24	3	53.7	18.1
Transportation	8	0	39.5	18.6
Craftsmen	7	0	41.7	14.6
Services	2	1	25.0	37.5
Laborers	7	2	48.9	19.1
Unclassified and No Response	18	5	46.1	14.7
Total	241	50		

Table 16 Distribution of Students By Education of Mother and MS.5 Grade

	Total (1)	less than 1.49 (2)	1.50-1.99 (3)	col(2+3)/(1) % (4)	2.00-2.49 (5)
Illiterate	153	4	14	11.8	41
Able to read and write	223	5	14	8.5	74
Primary	608	13	43	9.2	200
Lower Secondary	135	3	7	7.4	45
Upper Secondary	57	1	5	10.5	9
Certificate	50	0	3	5.9	17
Below B.A.	33	0	1	3.0	7
B.A.	31	1	5	16.0	9
M.A.	7	0	0	0.0	2
Ph.D.	0	0	0		0
not reply	131	3	12		45
Total	1,428	30	104		449

Table 16 Distribution of Students By Education of Mother and MS.5 Grade (Cont.)

	2.50-2.99 (6)	3.00-3.49 (7)	3.50-4.00 (8)	col(7+8)/(1) (9)
Illiterate	57	28	9	24.2
Able to read and write	82	38	10	21.5
Primary	234	101	17	19.4
Lower Secondary	53	26	1	20
Upper Secondary	30	8	4	21
Certificate	19	9	2	22
Below B.A.	16	7	2	27
B.A.	9	5	2	22
M.A.	3	2	0	28
Ph.D.	0	0	0	
not reply	51	17	3	
Total	554	241	50	

Table 17 Distribution of Students by Region and MS.5 Grade

	Total	less than 1.49	1.50-1.99	2.00-2.49	2.50-2.99	3.00-3.49	3.50-4.00
Bangkok	875	20	68	281	333	147	26
	(100)	(2.3)	(7.8)	(32.1)	(38.1)	(16.8)	(3.0)
Central	149	0	12	50	55	26	6
	(100)	(0.0)	(8.1)	(33.6)	(36.9)	(17.4)	(4.0)
North	172	4	10	37	74	39	8
	(100)	(2.3)	(5.8)	(21.5)	(43.0)	(22.7)	(4.7)
Northeast	90	4	5	29	34	12	6
	(100)	(4.4)	(5.6)	(32.2)	(37.8)	(13.3)	(6.7)
South	110	2	7	43	47	9	2
	(100)	(1.8)	(6.4)	(39.1)	(42.7)	(8.2)	(1.8)
East	32	0	2	9	11	8	2
	(100)	(0.0)	(6.3)	(28.1)	(34.4)	(25.0)	(6.25)
Total	1428	30	104	449	554	241	50
%	(100)	(2.1)	(7.3)	(31.4)	(38.8)	(16.9)	(3.5)

Note : Values in parentheses are percentages

Table 18 Determinants of Average Teachers' Salaries

Explanatory Variable	Estimated Coefficient	t - value	Mean	Standard Deviation
Average Teachers' Ages	47.87	28.00	33.39	3.64
Average Teaching Years in this school	46.23	18.68	6.86	2.68
Average Teaching Hours per week	-44.40	17.79	17.13	1.83
Proportion of Teachers with Bechalor Degrees and above	341.63	7.04	0.65	0.08
constant	1,015.66			
R^2	0.849			
$\bar{R}^2$	0.849			
F	1,672.042			

Note : The mean and standard deviation of the dependent variable is 2394.22 and 356.55 respectively.

Table 19 Regression Equations for the MS.5 Grade With Home Inputs Enter Prior to School Inputs

Explanatory Variable	Estimated Coefficients	t - value	Estimated Coefficient	t - value
Class size			- 0.004	2.14*
Average teacher's salary			0.0001	2.20*
Teacher's attentiveness			- 0.038	1.56
Number of siblings in school	0.018	1.78*	0.016	1.57
Mother's education	0.014	1.21	0.013	1.12
Repeat any grade	- 0.329	4.73**	- 0.304	4.35**
Health condition	0.107	3.18**	0.107	3.19**
Constant	2.331		2.242	
R^2	0.036		0.044	
$\bar{R}^2$	0.032		0.038	
F	8.944		7.842	
n	1,213		1,213	

*Statistically significant at the .05 level

**Statistically signficant at the .01 level

Table 20 Regression Equations for the MS.5 Grade With School Inputs Enter Prior to Home Inputs

Explanatory Variable	Estimated Coefficients	t - value	Estimated Coefficients	t - value
Class size	- 0.005	2.21*	- 0.004	2.14*
Average teacher's salary	0.0002	3.01**	0.0001	2.20*
Teacher's disattentiveness	- 0.05	1.92*	- 0.038	1.56
Number of siblings in school			0.016	1.57
Mother's education			0.013	1.12
Repeat any grade			- 0.304	4.35**
Health condition			0.107	3.19**
Constant	2.395		2.242	
R^2	0.016		0.044	
$\bar{R}^2$	0.013		0.038	
F	6.3498		7.842	
n	1213		1213	

* Statistically significant at the .05 level

** Statistically significant at the .01 level

Table 21 Means and Standard Deviations of Variables in the MS.5 Sample

Variables	Mean	Standard Deviation
(1) MS.5 GPA	2.464	0.639
(2) Number of Siblings in School	2.643	1.771
(3) Mother Education	1.934	1.570
(4) Repeat Any Grade	0.073	0.261
(5) Health Condition	1.661	0.539
(6) Teacher Attentiveness	2.309	0.734
(7) Class Size	41.154	8.688
(8) Teacher's Average Salary	2390.5	355.545

Table 22 Matrix of Correlation Coefficients of Variables in the MS.5 Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	100	0.05	0.04	-0.15	0.11	-0.06	0.09	-0.07
(2)		1.00	-0.02	-0.02	0.02	0.04	0.09	-0.01
(3)			1.00	0.01	-0.002	-0.09	0.07	0.02
(4)				1.00	-0.09	0.04	-0.13	0.04
(5)					1.00	-0.06	0.02	0.004
(6)						1.00	-0.03	0.04
(7)							1.00	-0.05
(8)								1.00

Note : See variable names in table 21

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