UP School of Economics
Discussion Papers

Discussion Paper No. 0905 August 2009

High School Background and Academic Performance

by

Gerardo P. Sicat* and Marian Panganiban**

*Professor of Economics Emeritus **Graduate Student
University of the Philippines School of Economics

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I. INTRODUCTION

One measure of human capital formation – that is, of *education* – is the academic grade that the student obtains at the end of a course. The grade could be used as a proxy for effectiveness or the quality of the student's performance. If grades are the output of the educational process, then the quality of the inputs matter. In this production function for educational output,

*The authors are Professor of Economics Emeritus and Graduate Student, University of the Philippines School of Economics. The Philippine Center for Economic Development gave financial support for this study. Kristine Joy Briones assisted in part on statistical and methodological support and with R.T. Campos undertook the data preparation work. The University of the Philippines authorities provided encouragement and support of this study, especially the Registrar's Office, the Admissions Office, and the Scholarship Office. The Department of Education provided some assistance in disentangling the high school classification system. Sharon Faye Piza of Asia Pacific Policy Center provided us with vital links to economic development data. The senior author thanks his many teaching assistants in the Economics 11 course through the years. Among their duties, they conducted discussion sessions of the small subsections, suggested examination questions, and corrected them.

various factors are important. The nature and quality of instruction of course is a major input. So is the effectiveness of the teaching material used or the teacher's own effectiveness in explaining the subject. Taking these factors as given, the nature of the inputs in the educational process becomes important.

Initial motivation

As an educator, the senior author's flow of students in his lectures in Introductory Economics at the University of the Philippines has become a reason for posing such a question. Could their performance in the course be a predictor of their actual performance in the university? Although such answer could only be a partial predictor, it is desirable to understand its magnitude. One way to provide an answer was to build up the data base involving the diverse backgrounds of these students. Testable propositions useful in the study of educational output with implications on university policy as well as development policy in general could result from a broad based analysis of the information.

The students, their background, and UPCAT

Many students have taken the introductory Economics course under the senior author since 1998 when he began teaching it again. The course is an elementary course and it is a required course for many of the students. The curiosity posed a number of testable issues about education. It goes beyond educational issues. The investigation could link educational with economic development factors. After all, the student is a product of his/ her unique background. That background could be split into various factors: the student, his/ her family, community (city, province, or place) of origin, and finally, high school of graduation.

The student's performance in the course could be interpreted in a number of ways. It is a unique measure of the individual's achievement during a specific lifetime. On another plane, the grade for one subject could be a proxy for similar subjects or aspects of individual performance in the university. This is at least true for a limited set of related courses. On another specific level, it is what it is – a proper study of the performance in an Economics subject. For this last interpretation, the study could be a study of the effectiveness of Economics learning, or of the teaching of it, to students.

Whatever might be the perspective applied to the work, it could be useful in posing some questions about educational policy – either at the university where it is taught (in this case, UP), or at the national level. The output (of educational policy) is dependent on the quality of the inputs to the educational process. The performance of the inputs as explanatory variables would help to focus on their broader implications to education policy.

This paper focuses on the nature of the high school background of the student. As the country's premier learning institution supported by the government, the University of the Philippines is the magnet for collegiate study for most high school graduates who plan to go to college. At least, it might be the principal university of destination for those who qualify to enter it. In order to get admitted to the UP however, the student has to pass the UPCAT, or the UP College Admission Test.

In earlier years when testing for entrance was introduced, the UP relied on a nationally administered national college entrance test (NCEE). But the experience with the NCEE system led the UP to withdraw from the system. The UP felt that the NCEE could not properly serve the UP. It was designed to serve a very wide group of high school graduates who sought admission to college in the country. However, the standard test was not sufficiently discriminating and challenging enough for the standards that UP required.

The UPCAT is designed to meet the standards set for UP and the test questions are difficult than the NCEE.[1] Thus, the UPCAT enables the university to attract better qualified set of students upon entry. The students who pass the UPCAT contribute to the formation of a more homogeneous student body in terms of intellectual ability.

On the part of students and of parents, UP is highly desired as a university of destination. Most graduates of the high school system seek a UP education if they can make it for academic and other reasons. As a state-supported university, the low tuition fees make it possible for the university system to admit more students to enter the university provided they pass the UPCAT. The desire for higher education – and for a UP education – is rooted in the generally widely held and correct belief that education is a strong predictor of the standard of living.

The student's performance in the UPCAT is also used as a dependent variable (in place of direct academic performance). The UP admissions office devised a formula to rank the performance of applicants through a concept of University Predicted Grade (UPG). The UPG is a single number that summarizes the various components of the UPCAT – English, Mathematics, Science, and Communication – that satisfies the university's conception of objectivity and fairness.[2] The UPG then is like an index number that is useful for the ranking of all

[1] When the UP abandoned the NCEE, the nationwide college entrance tests were later abandoned.

[2] We take this UPG information and use it as a statistic. The UPG is a weighted equation involving the various performance of UPCAT takers. However, we could not get any information on its origin as the University authorities have not made available to us the origin as well as methodological basis of the calculation. It is likely to be a multiple regression based on examination results of previous UPCAT takers. But we have no information of the methodological paper that was used to calculate it. The equation also does not contain the error terms of the

the applicants to UP. With the use of a cutoff UPG score, the applicants higher UPG scores get admitted and those with lower scores than the cutoff are not admitted. The UPG is further discussed under data below.

In addition to the above, social and economic origins also play a role [Lontoc, 2006]. These social and economic origins are in part associated with geographic or community level factors. Such community based factors include the high school of graduation of the student. The high school is part of a larger community that is supported in general local effort – at the local government level. Thus, a focus on the role of the high school of graduation and the student's performance in college is likely to yield a useful line of inquiry.

Introductory Economics as proxy for academic performance

The students who enrolled in Economics 11 represent the sample of this study beginning in 1998. The course is a three unit introductory course on Economics. The course has evolved over this period. Also, the textbook used also evolved during the period. The senior author needed the lectures of the early years to guide him in the revision of the textbook that he had written for Filipinos studying introductory Economics. Such a textbook had been in use since 1984 when he published the book. When he returned to the country in 1998,[3] he taught the elementary course as part of a master plan to revise the book and bring it up to date. The revision was successfully undertaken in 2003 when the revised textbook was published and supplanted the old one. Before the completion of the revisions a few Teaching Notes that were later incorporated in the revised textbooks were circulated as readings to the students then enrolled. The inclusion of many Philippine examples in the elementary text plus its ordering of subject matter which is more applicable to the country's context makes the book different from foreign textbooks on the subject.[4]

Before 2002, the course was part of the courses needed for an Economics or business track course and as a senior elective course for some social sciences courses. As a result of a realignment of educational philosophy on General Education curriculum, the introductory Economics course became a required course taught in the University,[5] especially for students on a social sciences

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regression so that we have no knowledge about its quality as a parameter with a statistical base.

[3] The senior author worked abroad for almost thirteen years in a major international development institution. He had tried to revise his book while in Washington D.C. but found the task too demanding and postponed it upon his return to the country.

[4] For a review of the textbook shortly after its publication, see Hal Hill (2004).

[5] See Appendix 1: Courses that require Econ 11

learning track. This has altered the emphasis of the course. Instead of being a straightforward introduction to Economics, the importance of the role of the state or the government is taken into account in pursuing the analysis of market behavior. Also, the composition of students taking the course has changed somewhat. Younger students now dominate the recent enrollments in the course.

More than 1,000 students have been handled by the same professor in this course. By focusing on this population of students, the teacher becomes a given and no longer a variable in the study. Even though the teacher also learns and improves as time goes by, this factor is effectively controlled for the study. For one, the evaluation methods are set more uniformly.

For instance, the grading method for the course has remained relatively intact. The final grade is attained from averaging three major unit examinations that are given at different points in the course. Students who perform well in the three examinations get the option of not taking the final examination, provided their standing met the minimum standards of performance for exemption from that final test. For purposes of the study (and in view of the limitations of the data gathering prior to the intense data analysis) only about 700 of the students who took the course in the earlier years up to 2004 are included in this study.

Examinations are multiple choice objective questions. In this setting, the importance of preparing different questions each time the course is given in a semester is a constant challenge for the professor. His teaching assistants are required to prepare suggested questions, dividing up the topics. But in all cases, the main professor prepares the questions to make sure that each examination for each term is unique from the others. An experienced teacher can ask the same question in a number of different ways so that a question is unique. About 50 questions are asked for unit tests. For the final examination, 75 questions are given. A review of these test questions are filed and openly shared with all students enrolled in the Economics class in the UP School of Economics Library. At least one typical unit exam in the past is posted in the website for the course to make sure that all the students face a level playing field for studying and preparing for the examination.

One major development that changed the environment of the class is the development of teaching technology. The lectures – two a week -- of the course are given to around 200 students in the large lecture room of the School. The big class is broken up into small discussion classes of 20 to 30 students for the third class hour of the week. It is led by a teaching fellow. In the early years, the technology for teaching had the professor lecturing through microphone and using slide projections and transparencies where he would make his drawings and charts. Before the advent of these improvements some semesters and

school-years back, the blackboard was the primary visual used. By the 2002, PowerPoint presentation became the instruction mode. The PowerPoint slide presentation accompanies the lecture and has become an effective means of demonstrating graphical work. Graphs could be drawn in steps to demonstrate a process in doing the elementary part and then some graphs can be pulled back for recall easily. This process of change has made the teacher adept and fulfilled in manipulation of point and click technology to change the image projected within a given slide and as one progressed between slides.

To emphasize recall, each of the PowerPoint lectures are summarized in handouts that are presented through an Adobe .pdf file and made publicly available in the University Virtual Learning Environment (UVLE). The UVLE is a web-based learning system in the UP that enables all students enrolled in a course to avail of a communication system between teacher and students. Its usage depends initially on the professor's inclination to make it a communication system for exchanging information, ideas, class readings, and other interactive materials. Unfortunately, the system is only gradually being utilized by students who have computers. (Also, the system could only be used by faculty who had progressed to the required level of computer literacy.) By the last count 70 percent of all enrolled in the course students access the UVLE. To be sure that those who are excluded out of the UVLE for lack of computers still get the web-based storage of teaching materials, lecture handouts are also copied to the UP Economics Library where students could avail of the same and photocopy them for their use if necessary.

II. A MODEL OF ACADEMIC PERFORMANCE

Many influences account for academic performance in college. Classifying these influences is an important task. The first set of characteristics is associated with the student's unique endowments – intelligence, effort and perseverance, psychological disposition or preparation (perhaps a factor that can be termed relative maturity), and income position. Income could be an attribute that is dependent on family background and circumstances. Also, the family could influence the nature of the intelligence and the study habits inculcated at home. Value formation – important in later educational performance – is as much developed at home as it could be in school.

The collegiate environment would be another important consideration. Such an environment could include the place of study, the course being taken, the quality of instruction, and of course, the interaction that the student has with other students. Interaction with other students could bring it other pressures related to focus and effort devoted to the student's work. A competitive atmosphere among the student cohorts could improve performance. A disruptive atmosphere could focus and bring performance down.

Lastly, there are pre-collegiate factors that could be considered. Here the importance of a number of variables associated with the student's high school of graduation, the community in which he is located, and other factors that are related to that community's level of development would be important factors to study.

Putting these various characteristics together, academic performance (***AP***) of student *i* would be dependent on a number of distinct factors that can be as treated as a set of vectors representing the student's grouping of specific attributes, as follows:

$$AP_i = F(\ vectors\ of\ X1_{ij},\ X2_{ik},\ X3_{il},\ X4_{im},.\ e_i)$$

where ***X1*** refers to the set of individual characteristics that are associated with the student *i*, and the corresponding indicator *j* to the specific characteristic; ***X2*** to high school of graduation characteristics of student *i* with the indicator *k* referring to the nature of the high school (public, private, etc.); ***X3*** to regional attributes of student *i* among island groups associated with with *l* referring to the island group (Luzon, Visayas, and Mindanao); ***X4*** to the specific class of local government (City class 1, 2, 3) where the address of the student *i* lives; and *e* to the error term.

This paper examines more specifically the second and third set of characteristics which are associated with the high school background of choice. A separate paper (Sicat and Briones, 2008) is concerned with the study of the broader set of characteristics that determine academic performance that are associated with ***X1***.

III. DATA BASIS OF STUDY

The data for this study comes first from the grades derived in the Economics 11 class already described. Working from the enrollment in the class, the student backgrounds were traced back using the UP admissions data base. All students admitted to the university have their high school background, place of residence prior to admission, and other demographic data recorded at the point of registration in the UP.

Once the specifics of the student's characteristics were known, their identities were scrambled and each set of observations took on a unique but anonymous identity. There is therefore no way of identifying the specific student once all the required information for the research was reached.

Further data on the student's regional background and high school locations were built from the income and expenditure surveys of the government for the periods that were coincident with their enrollment periods in the UP. Still further data on fiscal expenditure that are part of the local

government systems were taken from government reports on municipalities and local governments.

High school of graduation

The high schools follow the classifications of the Department of Education. High schools are classified as *private* or *public*. Private high schools are either sectarian or secular. Because of the large numbers of high schools, it is not easy to make distinctions between secular and sectarian. As a result, that effort to identify further the schools in this fashion was dropped. Thus, there is only one kind of private high schools in the study.

Public high schools are government supported schools. Different funding patterns for public schools distinguish public high schools further. Public high schools are supported by the local governments where they are located. But there are public high schools that are further supported by the national government if they have been transformed into national high schools. For purposes of this study, aside from the usual public high schools, two other types of public high schools are tracked. The first of these are the state-supported high schools. These high schools are supported by the local government or partially by the national government. Such high schools include those public high schools that are attached to some state universities that maintain high school departments. These include the branch campuses of UP system that have continued to maintain high school units.

There are also publicly funded special science high schools. The Philippine Science High School is unique in this regard because all the students are scholars supported by the Science and Technology Department and the curriculum is science-based. Some well-to-do local governments have also created science high schools. Prominent among these are Manila Science High School and the Quezon City Science High School. All these high schools are classified as *science* high schools. In this sense, the other state-supported high schools are non-science high schools.

There is a high demand for admissions into the UP. In this sense, all high schools whether public or private in the country feed the best of their qualified graduates to the UP admissions system. The diversity in the income earning capacities of the local governments creates situations that some public high schools are better funded than others. As a result, the quality of the high school education is likely to be uneven. Poorly funded schools are likely to have poor standards of instruction compared to the well-funded ones.

Fiscal status of local community where high school is located

Another set of data concerns fiscal information about the class of province, city or municipality where the high schools are located. This characteristic is determined by the economic capacity of the community

measured by its ability to raise fiscal resources. The Department of Finance under the Treasury Bureau determines the financial status of local governments by criteria that are based on tax collections and fiscal capacity. An effort is made to bring this class of data into the study although the issue is more fully treated elsewhere.[6]

One way of doing this was to separate the fiscal status of the city or local government concerned and provide some variable to identify these units. Another method is to group the regional areas according to the three main island groups of the country.

The *UPG* – University Predicted Grade

The *UPG*, an important number already discussed earlier, is the critical variable used for admission into the UP system. Although the UP system units have different UPG thresholds for their admission of students, the UP Diliman Campus (where the UP School of Economics is located) has the highest threshold for admission. The UPG ranking of the student applicants are used to truncate from the admissions list those who fail to reach the threshold score level.

The UPG could be associated with pre-collegiate attributes of the student's personal abilities and, to some extent, those that are learned from high school. In this sense, it could be used as an explanatory variable for student's academic performance. The UPG (or its components) could be associated with the high school setting.

The *UPG* is a composite factor that is derived from the student's various scores and responds to a few normative factors that have been used as desirable for evaluating UP's admissions policy. It is an equation that satisfies various factors integrated with this policy. In particular, it is specifically calculated as follows:

> ***UPG* = 2.8101 – 0.047147*(*Mathematics*) – 0.046402*(*Reading Comprehension*) – 0.1381*(*Language Proficiency*) – 0.15531*(*High School Weighted Average*) – 0.025178*(*Science*)*(*Language Proficiency*)*(*High School Weighted Average*).**

The UP grading system is a grade of "1" to "5" where "1" represents the highest grade, a grade of "3" is passing, and "4" is conditional failure subject to meeting certain requirements (normally a passing grade) and, finally, "5" failure. Fractional grades from "1" to "3" are normally allowed, but "4" and "5" are given as whole numbers.

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[6] See G.P. Sicat and Kristine Joy Briones (2009).

Based on this formula, the expected grade would rise as a result of the influence of various factors that are considered important: mathematics, language proficiency, reading comprehension, high school weighted average, and science. (Note: Because the grade is higher the lower the UPG as a result of the grading system, deducting the influences of these factors from the constant grade of 2.8101 actually raises the grade!) Language proficiency and high school average are the highest weights that could pull up the grade, but some geometric mean of science, language proficiency and high school weighted average completes the additional weight that helps to further adjust the value of the *UPG*.

This weighting process of the *UPG* is applied in arriving at predictive analysis of student performance at the level of the UP authorities. However, the methodological studies leading to the formula are – up to this time – not available to these researchers. The formula might have been derived from some meaningful effort to define performance indicators.

Academic performance in Economics 11

The grade that the students enrolled in Economics 11 received represent the measure of actual performances based on work in the course. It is a measure of the student's understanding of the subject matter taught in the course. The mean of performance in three unit examinations are used. If the student's performance – plus other factors such as performance in small quizzes, discussion participation, and completion of problem solving assignments, and of course attendance in the lectures and discussion are met – meet the standard for exemption for the final examination, then the student's grade is normally already determined. Otherwise, a long final examination (also optionally taken by those who wish to improve their average performance) is given a fifty percent weight to the average of the three unit quizzes.

It is important to undertake a transformation of the grades for general understanding of these grades in a regression formula. The UPG and the grades in Economics 11 are of course given under the UP system of "1" to "5", with "5" indicating failure. To arrive at an easy interpretation of results where high grades are reflect a high level of performance, it is useful to transform the grades and reverse the UP scale, so that 5 becomes the highest grade and 1, failure. This is easily done by using the formula below:

Revised Grade = 6 – Actual Grade.

The grading basis for Economics 11 in through the use of ranges of examination scores that converted to the grades. Equivalently those grades were worked back to the ranges of test scores. In the calculations below, the idea of replacing the actual grades with the midpoint intervals of these ranges is undertaken in order to perform an alternative regression calculation utilizing point intervals rather than the transformed grade.

Table 1 shows the grades and the corresponding intervals, using averages from the unit exams and final exams, and their equivalents. In general, failure to make the lowest intervals would mean a grade of failure.

Table 1: Grades and their corresponding percentage intervals

Grade	Range		Midpoint of range
	Lower bound	Upper bound	
1	96	100	98.0
1.25	92	95	93.5
1.5	88	91	89.5
1.75	84	87	85.5
2	80	83	81.5
2.25	76	79	77.5
2.5	71	75	73.0
2.75	66	70	68.0
3	60	65	62.5

IV. EMPIRICAL WORK AND RESULTS

Trial work on the data for the study leads to the conclusion of a linear regression fit using ordinary least squares estimation. The grade in Economics 11 is used to stand for academic performance. The explanatory variables are all the specific characteristics mentioned, emphasizing UPG first, then the set of regional community characteristics as identified and explained below, and finally, the high school of graduation as explanatory variables.

Data arrangements and values

On average, a student's grade in Economics 11 is 78 percent. Majority of the students in the sample come from private schools. In a usual lecture class of 200, around 106 of them will have graduated from a private high school. Since admission to UP is primarily based on intellectual ability according to the UPCAT score, it is expected that students in the class will have high percentile rankings in all four components. From the table, it can be seem that mean percentile rankings in the four admission test components are 82 and above.

Majority of students come from Luzon, with around forty nine percent coming outside of NCR. In a normal class of 200, around 81 students reside in NCR. Twenty five percent of students come from high school in cities with an annual income of P300 million or more and around twenty one percent of students come from high schools in cities with an annual income range of P180 million and P240 million.

The *UPG* values represent data points that the students had earned in the UPCAT. The UPG scores and their various components are used as data points

for different models to be used in the regressions. Each student has corresponding UPG and its breakdowns as data points.

The three types of high schools are marked as dummy variables. Public high schools are used as the reference variable for the high school of graduation. In each of these cases, the situation would be to mark the variable as "1" if the school matched that definition and "0" otherwise. There are three types of high schools, private, public (or state-supported non-science) or science high schools.

The other regional variables are also treated as dummy variables. A student coming from a specific regional variable has a value equal to "1" for that region and zero otherwise. Schools located in the National Region (Metropolitan Manila Region) are the reference variable. The other school locations are grouped by island groupings, Luzon (other than NCR or Metro Manila), Visayas and Mindanao. It is expected that the schools located in the NCR region have a significant disparity in the quality of education that high schools located there would offer over those from the rest of Luzon, the Visayas, and Mindanao.

A secondary set of regional variables are island groups and the chartered cities which are also used as dummy variables. There are four classes of chartered cities. The lowest class among them (or poorest set among the cities) is used as the reference variable. Hence, the various classes of cities for the student's region would have a value of "1" when he comes from that region and "0" otherwise. There are three city classes thus identified: class 1, class 2, and class 3. Since the reference variable for city class is the poorest class of cities, it is expected that any those high schools located in the other class of cities would have a larger impact on the academic performance of the students.

Table 2 summarizes the different variables used in the study. They are grouped according to the set of characteristics as stated in the model presentation.

Regression outcomes and their analysis

The results shown in Table 3 show the regression results that employ both *Model I* and *Model II*. As stated earlier, *Model I* uses the UPG as a composite statistic indicating the student's individual predicted academic performance as an explanatory variable. The UPG is the critical statistic that UP admissions uses in the final decision on who among the applicants to the UP would get admitted. So, it is an important – nay, critical – explanatory variable of academic performance.

Table 2: Summary Statistics

VARIABLE	MEAN	STD. DEV	MIN	MAX
DEPENDENT VARIABLE				
Econ11	78.0088	10.30291	55	98
SELECTED DETERMINANTS				
University Predicted Grade (UPG)	3.6662	0.1402	2.84	4.37
Math	82.2942	16.2179	8	99
Science	82.623	14.6636	13	99
Language	87.2559	10.8952	17	99
Reading	84.5155	14.2618	8	99
Private High School	0.5310	0.4993	0	1
Science High School	0.0985	0.2981	0	1
State High School	0.2000	0.4002	0	1
Luzon (non-NCR)	0.4932	0.5002	0	1
Visayas	0.0434	0.2038	0	1
Mindanao	0.0582	0.2343	0	1
First Class City	0.2513	0.4340	0	1
Second Class City	0.0710	0.2570	0	1
Third Class City	0.2186	0.1464	0	1

The other two sets of characteristics – high school of graduation and their status from the nature of their operations and the regional locations of the highschool and the student's addresses – are treated as dummy variables. The reference variable for the high school types dummy variable are the *public* schools; the reference base for regional dummy variables are the schools located in Metro Manila; and the reference base for the community governments where the students and high schools are located are the city classes 4 and below, the poorest among them.

Model II replaces the UPG as a single number and reverts to the specific scores of the students in their separate examinations in the UPCAT. Otherwise, the high school and regional characteristics are utilized in the OLS calculations as in *Model I*.

Table 3: Determinants of academic performance (High school characteristics, Model 3)
Dependent variable: Econ 11 grade; estimation by ordinary least squares

	MODEL I			*MODEL II*		
VARIABLE	COEFFICIENT	STANDARD ERRORS	P-VALUE	COEFFICIENT	STANDARD ERRORS	P-VALUE
UPG	23.3103	2.6792	0.000			
Math				0.0920	0.0264	0.001
Science				0.1129	0.0299	0.000
Language				0.0158	0.0411	0.700
Reading				0.0719	0.0326	0.028
Private-HS	1.1263	1.5816	0.477	-2.5808	1.6128	0.110
Science-HS	1.7741	1.8489	0.338	-3.5730	1.9166	0.063
State-HS	2.7063	1.6317	0.098	-3.0780	1.6509	0.063
Luzon	-1.1407	0.8960	0.203	-0.0146	0.9139	0.873
Visayas	-2.6687	1.8881	0.158	-1.7321	1.9187	0.367
Mindanao	-3.4571	1.7460	0.048	-1.2889	1.8145	0.741
1st Class City	1.0959	0.8891	0.218	0.6538	0.9116	0.474
2nd Class City	0.7417	1.4058	0.598	0.1567	1.4258	0.912
3rd Class City	1.1285	2.2893	0.622	0.8265	2.3197	0.722
CONSTANT	-4.4426	9.9243	0.655	60.0462	4.0291	0.000

No. of Observations: 706
R-squared = 0.1202

Using *Model I*, the UPG is statistically significant at a high level as a determinant of the student's Economics grade. The coefficient is positive. Interpreted as a marginal effect of the explanatory variable on the grade in Economics (since the regression is strictly linear), this says that a one-point increase in UPG leads to a 23.84 increase in the student's Econ 11 grade. This strongly confirms the UPG as a significant predictor of a student's performance in college.

The constant term is not significant. High schools located in Mindanao have a pulling down effect on the overall performance. However, high schools located in first class cities improve that performance. Under this regression model, none of the special classification of high schools – whether private, science, or state – has any direct differential influence from the public high schools. (The base of comparison, it should be remembered are the public high schools.)

This might appear surprising, initially. But if the UPG strongly captures the explanation for good academic performance, then the addition of relatively less strong factors among the inputs might not produce any statistically significant results. The UPG captures the influence of a student's high school grades so that the high school variable no longer carries much weight.

Regional and local government income characteristics have a weak explanatory power for academic performance. A pattern appears clear in the results of *Model I*. The regional variables are *not* significant at the 10 percent level. All of them, however, are significant at a slightly lower level of statistical tolerance – at the 15 percent probability level. Since the reference variable for this characteristic is the region of the National Capital Region, the results follow normal expectations about the quality of the high school environment in these regions. All of the coefficients are negative, meaning that compared to the schools in the NCR, the students outside of that region perform poorly.

These results on regional characteristics of the high school graduates follow a pattern. Using the National Capital Region or Metro Manila as the reference base, the high schools when classified by their in locations in the major regions of the country – Luzon, Visayas and Mindanao – only hint their influence on academic performance. Those in Luzon *outside* the Metro Manila area have a lower academic performance compared to those in Metro Manila. But they perform better than those who come from the Visayas. In turn, those who graduate from high schools from the Visayas region perform better than those from Mindanao.

Some of these findings are adjusted through the effects of administrative adjustments made in the name of equity considerations. The university admissions policy has adopted the *palugit* system as a means of increasing access to admissions of poorer students, which is discussed later, below.

Model II decomposes UPG into its original element s and uses all the scores that the student derived from the four groups of UPCAT tests: mathematics, science, reading comprehension in English, and language proficiency. Otherwise, all the other characteristics corresponding to region and to local government are treated in the same way as *Model I*. This model disaggregates the factors affecting UPG directly.

The breakdown of the scores of the UPG into science, mathematics, reading and language proficiency(*Model II*) indicates that of these factors, only language proficiency appears to be an unimportant determinant of course performance. All are strong predictors of academic performance. With this specification of the different components of UPG, how are the other explanatory variables of academic performance affected?

This elaboration has a definite impact on the role played by the variables related to the high school factors. Remembering that public high schools are

the reference case for these regressions, the scores of different clusters of high schools show a marked change. Science high schools and state supported non-science high schools score lower than public schools. Their coefficients are negative, meaning that they bring down the level of performance that is attributed to the overall constant of regression.

This is intriguing information. This means that overall, the public high school performance is in general higher than that of the special high schools, including those applicants students that graduated from the private high schools. In the case of private high schools, their negative coefficients are more weakly significant while the coefficients for science and state-supported high schools are safely significant at the 6.3 percent probability level.

Moreover, the coefficients for the high schools located in different regions of the country (with Metro Manila as reference base) no longer contribute to the explanation of the student's academic performance. This is also true for the different classes of cities where the high schools are located. In the latter case, the poorest cities (the 4th class cities) are used as reference base for the dummy variables corresponding to these city variable regressions

On reflection, *this finding is not surprising*. The UPG or its components – especially the student's abilities in mathematics, science, and reading comprehension in English – mainly and almost exclusively account for the significance of the regression. All the other factors or variables play second fiddle or not at all in explaining the results. The UPG measure and its major disaggregates explain the inherent or acquired individual abilities of the students who are in the population being studied.

The University of the Philippines is one of the most important filtering grounds for talent in the country. Only a small percent of the students who apply for admission is accepted and the main instrument for screening applicants is the UPCAT. Moreover, talent is randomly distributed across the country's regions. Therefore, some of that talent is also widely distributed among the country's high schools, including the public schools. Moreover, other factors like income and socio-economic circumstances intervene to make it possible for some of these talents to excel within the limitations of the public high school system. Within each public high school in the country, there are applicants to the university who belong to the few who are best and brightest among the students graduating from these high schools. These are the ones who manage to apply to the university. Within each of the high schools of graduation of whatever type of high schools, most of those who get accepted in the UP belong to outliers who are in the brightest brackets of graduates.

These findings also reveal quite a lot about the distribution of talent in the country which goes beyond the high schools of graduation. In general, proficiency of the student in mathematics, science, and reading are probably helped by a number of factors that are associated with social and economic

circumstances that are outside the school system. The high school might be the vehicle for the formal education of the student but perhaps the home, the student's innate abilities, and other socioeconomic factors are more important factors in determining individual performance in educational work in a course.

A further comment might be ventured on the poor statistical performance of language proficiency. Among the components of the UPG, this is the factor that appears to play an insignificant, if not negative, role in academic performance. Perhaps, this might simply be an indication of the deterioration of English language standards in the educational system. This is a phenomenon often admitted in educational circles as evidence of declining standards, but this issue is quite apart from what is investigated in this paper. Further evidence of this from classroom discussions is that many students find it difficult to express themselves fluently in English although if the tone of discussion were to shift to Filipino, fluent exchanges with students often result. However, the lectures in the course are given in English, the textbook is in the English language, and general classroom discussion is conducted in English, and finally the examination questions are conducted in English.

Still problematic in these results is the academic performance that can be attributed to the special category of high schools designated as science high schools. In the study, the science high schools were lumped together as a group and their contribution was designated under the dummy variable for science high schools. It became desirable to ask the specific issue of the performance of graduates from the Philippine Science High School. The question then is to ask what if the science high school variables were split between the graduates of the Philippine Science High School and the other special science high schools mainly supported by local governments. Perhaps some perceptible factors on quality of instruction in the sciences could be differentiated from among those bright students who had qualified to enter the UP coming from the usual public and private high schools. The science high schools will have graduates who are at least already superior in knowledge in science, mathematics, and reading in English as well as language proficiency.

This was undertaken. The group of science high schools is split into two separate groups – students who graduated from the science high schools supported by other local governments and those from the Philippine Science High School. Specifying these groups with their own dummy variables did not change the outcome of the regressions of Model II. The estimated coefficients (no longer shown in this study) have high error terms and therefore are insignificant. This means that among those who do well in their academic performance do so in part because of their superior ability in mathematics, science, and reading. But there are also those who do not perform well in the course. The distribution of high and low performers among these graduates from the science high schools tends therefore to have high error terms.

UPG as the dependent variable. It is useful to treat UPG as an outcome of many factors associated with the student's regional and high school characteristics. As such, it is useful to employ these characteristics as the explanatory variables of the UPG outcome to predict academic performance in college. Since UPG explains academic performance in Economics 11, the UPG becomes the overall academic performance variable.

Table 4 gives the results of OLS calculations of such a linear regression. In all these calculations, the treatment of the high school and regional characteristics is the same as in *Models I* and *II*: they are dummy variables associated with specific reference characteristics as were used before.

Table 4: Determinants of UP Admission:
Dependent variable: UPG; estimation by ordinary least squares

VARIABLE	COEFFICIENT	STANDARD ERRORS	P-VALUE
Private-HS	-0.0254	0.0223	0.255
Science-HS	0.0791	0.0260	0.001
State-HS	0.0171	0.0230	0.458
Luzon	0.0079	0.0127	0.538
Visayas	-0.0336	0.0267	0.208
Mindanao	-0.0405	0.0243	0.096
1st Class City	0.0377	0.0125	0.003
2nd Class City	0.0039	0.0197	0.845
3rd Class City	0.0350	0.0323	0.280
CONSTANT	3.6552	0.0228	0.000

No. of Observations: 706
R-squared = 0.0623

In general, using UPG as our dependent variable does help to produce new leads on the indirect roles of the high schools. Of course, this is related to the admission issue more than to the actual performance in the university. The constant term of the regression is statistically highly significant. This means that essentially, most of the outcomes are explained by the UPG score itself. Taking this statement more meaningfully, the individual student's performance in college is likely to be determined mainly by the student's own personal characteristics. The study has not been able to probe into this factor in detail.

The companion study to this paper[7] deals with a wider set of determinants that include collegiate and other factors. Just as important, other social and economic factors about the student's family background need to be investigated, for instance, the role of income and education of parents. A later survey that tracks down such additional variables has been tested however and a future separate study will make use of such additional information to extend this analysis.[8]

Going now to the explanatory variables themselves, there is limited additional information. Private high schools and science high schools have significant coefficients. Private high schools pull down the level of the constant term while science high schools add to it to a larger degree, by twice as much as the private high school impact. Remembering that the reference base for the dummy variables are public schools, this means that private schools tend to perform worse than public schools but science high schools which are government supported perform much better than public schools. The latter outcome is expected but the former – that on private schools – is less expected. The scores of students from science high schools are higher than those of students from public high schools by 0.7355.

The palugit system. In the case of private high schools, the negative sign is partly explained by the "*palugit*" system that is used in the UPG scoring which provides a reward for a pre-determined list of public schools (except the national, science and state supported high schools). At the time this paper is being written, the UP allots an automatic upgrade of the UPG by 0.05 thereby making the students from the identified high schools to score higher for equity reasons. Graduates of science high schools perform significantly better than other students in private, national, and state high schools however and they overcome this bias.

This automatic allotment of additional points for the identified high schools acts like a tariff against good performance and can therefore be seen as a wedge against well qualified students who are at the margin of admission through their UPG scores. The other side of the argument is that it is a direct subsidy to equalize opportunities of students who do not score as well. The assumption behind this subsidy is that they come from relatively deprived high school communities. The implication is that the student comes from poor families. But that might not be the case if they are not fully verified by the micro data. In any case, the effect is to crowd out the students with higher scores but who are near the margin of the UPG cutoff.

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[7] See G.P. Sicat and Kristine Joy Briones (2009) probes into more factors associated with the individual, his collegiate setting, and other factors.

[8] A subsequent study survey of last semester's students has been completed so that there are tentative conclusions that could be brought up along this line of research.

This poses an important question of justification or fairness. If it were possible to test for the impact of this tariff on academic performance on applicants to the UP, one method could be to identify on a micro-basis those students admitted from the pre-identified high schools and to introduce this bias as a variable in determining how they performed against the rest of the students. If the list of high schools so identified were available, it would be possible to test how significant is the impact of the *palugit* system and therefore to make certain conclusions about how effective it is in promoting greater equity in opportunities among those who seek admission to the UP. Needless to say, the *palugit* system as a result has engendered some policy controversy on admissions within the UP administration.

The high school regional location does not play as important a role as the specific type of high school. In all the three locations of Luzon, Visayas and Mindanao, the dummy variable coefficients are not significant statistically. One could possibly say that other factors in the admissions process have the effect of drowning out location by region. Yet of course, specific high schools in these three regions have received benefits out of the *palugit* system.

In the case of local government characteristics where the high school is located, the result of the regression shows that those local governments with high incomes have statistically significant dummy variable coefficients. The scores of students whose high schools come from these local communities are better endowed with resources, possibly raising teacher quality as well as school facilities. Only the city income class level 1 has a statistically significant income class. And students from these areas perform well better than those coming from the base reference city which is in this case class 4 cities and below.

Interval regression of Model I using Economics 11 grade as dependent variable. Using ordinary least squares regression with interval-coded data as we used in *Models I* and *II* has its drawbacks. Using the midpoints of intervals as dependent variables is unable capture the nature of the exact values within each interval with our other variables. To resolve this problem, an interval regression is administered with the same variables utilizing *Model I*.[9]

Table 5 presents the interval regressions. The third column of the table presents the standard errors. Based on these standard errors, which are robust estimates, only UPG comes out highly significant statistically, together with the dummy coefficient for Mindanao. A unit change in UPG leads to a 23.2209 increase in Econ 11 grade which is very close to our OLS estimate. In this model, Mindanao is a statistically significant at 0.05 probability level. But the coefficient

[9] Interval regression is similar to an ordered probit regression but with the cut points fixed and the coefficients of the explanatory variables and variance of the dependent variable estimated by maximum likelihood

is negative, meaning that Mindanao scores 3.5 points lower than students who come from Metro Manila.

Other variables are not significant. Although the standard errors are high, if the estimates are assessed on the basis of a weaker level of significance – for instance, if the coefficient estimates are at least greater than the standard errors, a picture emerges that shows that the type of high schools try to tell a weak story. Students who graduate from science high schools and state supported high schools score better than public school graduates.

It is also clear from the results for regional locations of students that they score less than those coming from Metro Manila (as in the case of those from Mindanao above which shows the lowest performers.)

The adjusted R^2 is 0.122 indicating that our selected predictors for academic performance accounted for approximately 12.2% of the variations associated with the dependent variable.

V. CONCLUSION

This study is about academic performance in college as measured in the grades of students in the introductory economics course. The factors studied rely on data involving the grades of students in the university entrance examination. In addition, the data on registration and are used to build on the high school and regional backgrounds of students. These other factors are pre-collegiate variables related to the student's high school of graduation, their location and the local governments that support the schools. Data on test performance of the students are utilized extensively. This is in terms of the university predicted grade which is a weighted average of several different component scores in the entrance tests. The university entrance test has four major components that test the student's knowledge: mathematics, science, reading comprehension, and language proficiency. The latter two components are based on knowledge of English.

The results of the study affirm that individual student ability is the main building block of academic performance in the university. The other factors that are presumed to play an important role in the student's academic performance are not revealed by the various regression equations around this model of academic performance. In general, talent and academic performance in the university comes from a broad spectrum of high schools in the country and are not necessarily confined to special types of high schools of graduation or the general locations of the high schools across the country. This conclusion is borne out by the fact that talent distribution in the country is randomly distributed across the country. Some types of high schools might produce special types of graduates with greater knowledge of some aspects of learning. But applicants to the university are effectively filtered by the university entrance examination which selects – on the basis of the scores that the student obtains --

Table 5: Determinants of academic performance
(Dependent variable: Econ11 grade in intervals; estimation is by interval regression)

VARIABLE	COEFFIECIENT	ROBUST STD. ERRORS
University Predicted Grade -UPG	23.2209***	2.3685
Private High School	1.1048	1.5658
Science High School	1.9361	1.8206
State high school	2.3461	1.6049
Luzon (non-NCR)	-1.1543	0.8556
Visayas	-2.8104	2.0193
Mindanao	-3.5087*	1.755
First Class City	0.8852	0.8429
Second Class City	0.4836	1.386
Third Class City	0.8712	2.0207

$Chi^2(10)$ = 117.63
Prob > chi^2 = 0.0000
Log pseudolikelihood = -1686.4164
Adjusted R^2 = 0.122

legend: *** p<0.001

The role of the high school of graduation and other factors associated with the student's origin come out indirectly however. Of course, this is only critical at the point of enrollment into the rosters of students in the university. Here, the high school of graduation does play an important role. When the weighted university predicted score is used as the dependent variable in the high school of graduation did not do much better than the performance of the public high school graduates, except for the graduates of the Philippine Science High School. The average scores of graduates of high schools from other parts of the country are less than those of high schools from the Metro Manila regions. In the same fashion, the scores of high school graduates from schools located in the cities of the country are poorer than those of high schools of the better-funded first class cities. In short, the quality of funding and the level of development of the community in which the high school is located are contributory factors to the student's ability to be admitted into the university.

Indirectly, the type and location of the high school o help to produce applicants who perform with superior scores in the entrance examination and therefore get admitted into the university. But once they are in the university

environment of learning, the student's own individual characteristics and other factors associated with other social and economic factors become important. This paper has little to say about these factors but subsequent studies are forthcoming that attempt to address these issues.

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Appendixes

Appendix 1: Courses where Economics 11 is a required subject and the colleges where they are offered

Courses where students are required to enroll in Econ11
B.A. Communication Research (College of Mass Communication)
B.A. Public Administration (National College of Public Administration and Governance)
B.S. Business Economics (School of Economics)
B.S. Clothing Technology (College of Home Economics)
B.S. Economics (School of Economics)
B.S. Family Life & Child Development (College of Home Economics)
B.S. Home Economics (College of Home Economics)
B.S. Hotel, Restaurant & Institution Management (College of Home Economics))
B.S. Mining Engineering (College of Engineering)

Appendix 2: Income Classification for Cities

(Based on Department of Finance Department Order No.20-05 Effective July 29, 2005)

City Class	Average Annual Income
First	P 300 M or more
Second	P 240 M or more but less than P 300 M
Third	P 180 M or more but less than P 240 M
Fourth	P 120 M or more but less than P 180 M
Fifth	P 60 M or more but less than P 120 M
Sixth	Below P 60 M

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