
Factors Affecting Academic Performance of Undergraduate Students

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ABSTRACT:

The purpose of this project is to determine which socio-economic and demographic factors have impact on students' academic performance, Cumulative Grade Point Average (CGPA), of students in faculty of science and technology, Thammasat University. To meet this objective, the data was collected from 300 fourth-year undergraduate students at the faculty in the University by using questionnaire, which covering several questions includes students' characteristics, family background, education background, peers' behavior, and academic performance (CGPA). The dependent variable (CGPA) was categorized into five groups consists of the top 20 percentile to the bottom 20 percentile according to students' CGPA, and ordered each group from one to five (the top 20 percentile). This allows us to analyze data by using an ordered probit model. From the result of this research, factors such as the employment, study habit, interest in the study field, parents' status, education level of father, place of high school, study program in high school, academic performance in high school, student loan, living in the University dormitory, and Night-out habit have impact on the cumulative grade point average and the probability of getting better academic performance.

Keywords: *Academic Performance, Ordered Probit Model*

INTRODUCTION

A university plays a significant role in a country's development in every field such as economy, society and politics. It is a higher education and research institution that provides a specific knowledge in various subjects. The main duties of university, in general, are to produce quality graduates and research, to provide the educational services, and cultural preservation. Moreover, education is an important factor of human resource development, if the population has a high level of education, they will be able to develop the country rapidly in every field. It may also lead to higher individual income, the distribution of income and economic growth. To develop country, we need to develop people in the country, especially in educational way, which is a quality and sustainable development. Therefore, better education should become the top priority because it is an important factor to build and develop thought, behavior and moral of people. Especially in developing countries usually have effective educational system but education lacks adequate infrastructure in developing countries.

Thailand is a developing country. The educational development, hence, is an important way to improve the quality of life, to enable people to keep pace with rapid change in society and also contribute to the development of the country in all aspects. Faculty of Science and Technology, Thammasat University is one of the public Universities in Thailand. It is its responsibility to produce the high quality graduates to become great leader and manpower of country.

Academic performance, mostly used Cumulative Grade Point Average (CGPA), is one of the indicators that measure a graduate's quality. Moreover, many employers use the cumulative GPA to screen out the job candidates and they mostly prefer a candidate with a higher CGPA (Erdem et al., 2007). Several factors are considered having impact on the students' CGPA such as gender, age, educational background, education level and income of family, social environment, etc. Since there is a lack of studies about factors that have impact on undergraduate students' cumulative GPA in Thailand, this study is expected to fill the gap in the literature for this research area.

In this study, data was collected from the fourth-year undergraduate students in faculty of science and technology, Thammasat University in June 2015 using stratified and simple random sampling technique. Questionnaire was used as a research instrument, which covering several questions includes students' characteristics, family background, education background, peers' behavior, and academic performance (CGPA). According to Erdem (2007) research, the dependent variable (CGPA) was order and categorize into five categories that consists of the top 20 percentile to the bottom 20 percentile according to their cumulative GPA. This type of dependent variable, therefore, allows us to use an Order Probit model to examine determinants of undergraduate students' cumulative GPA.

OBJECTIVES OF THE STUDY

1. To identify which factors affected academic performance of undergraduate students in faculty of science and technology, Thammasat University.
2. To examine the impacts of those factors on the probability of getting a higher CGPA of undergraduate students in faculty of science and technology, Thammasat University.

DATA AND METHODOLOGY

This study was conducted in an attempt to determine which factors have impacts on the university student's academic performance and their impact on the probability of getting a higher CGPA. The factors that we focus on in this study are students' characteristics, family background, education background, and peer behavior.

Primary data were collected by a survey submitted to the fourth-year undergraduate students in the faculty of science and technology of Thammasat University in academic year 2014/2015.

In this study, the survey design was used to obtain the data. Survey studies are designed to obtain precise and persistent information concerning the current state of phenomena. Survey methods are non-experimental for they deal with the relationships among non-manipulated variables. The dependent variable of the study is the students' academic performance (CGPA), which was measured for the period of academic years from 2011 to 2014. The independent variables of the study are the factors we expected that they have an impact on the dependent variable, there are: students' characteristics, family background, education background, and peer behavior.

The target population of this study is the fourth-year undergraduate students (the last year students in bachelor degree program) in the faculty of science and technology, Thammasat University in the academic year 2014/2015. There are ten departments in the faculty: Mathematics and Statistics, Physics, Chemistry, Computer Science, Agricultural Technology, Environmental Science, Rural Technology, Food Science and Technology, Biotechnology,

and Textile Science and Technology. The total number of target population is 599 students: 177 males and 422 females. Table 3.1 shows the distribution of the target population.

Table 1 Distribution of the Study Population

Department	Male	Female	Total
Mathematics and statistics	65	112	177
Physics	17	40	57
Department	Male	Female	Total
Computer Science	51	54	105
Agricultural Technology	5	26	31
Environmental Science	5	25	30
Rural Technology	8	15	23
Food Science and Technology	10	37	47
Biotechnology and Textile Science	5	38	43
Textile Science and Technology	4	27	31
Totals	177	422	599

Source: Administration of the faculty of Science and Technology

STRATIFIED AND SIMPLE RANDOM SAMPLING

The fourth-year students in the faculty were stratified according to their departments. Then, simple random sampling was employed to select students from each stratum. Since all the students have students' number, we decided to use a table of random number to select students from each department by proportion through their students' number.

To determine a sample size, we used Yamane formula (1973) at 95% confidence interval. The formula shown below:

$$n = \frac{N}{1 + (N * e^2)}$$

where n is number of sample, N is number population, and e is allowable error. From calculation, the appropriate sample size is 240 samples. Therefore, we decided to collect data of a total number of 300 students in the faculty, separated in each stratum as a proportion of their students. Table 3.2 shows the sampling matrix.

Table 2 Sampling Matrix

Department	Population	Sample size
Mathematics and statistics	177	89
Physics	57	29
Chemistry	55	28
Computer Science	105	53
Agricultural Technology	31	16
Environmental Science	30	14
Rural Technology	23	11

Food Science and Technology	47	23
Biotechnology and Textile Science	43	22
Textile Science and Technology	31	15
Totals	599	300

RESEARCH INSTRUMENT

Questionnaire was used as a research instrument to obtain the data. Steps of creating the instrument and its details are provided below.

1. Study theory, principle and idea from research documents, related books and questionnaires to understand the interested variables and get the guidelines to create questionnaire.
- Gather all information about questionnaire from the related research papers, include methods how to create a questionnaire, questionnaire design, and the measurement example. Then, create the questionnaire by considering the following issues: the questions are easy to understand and cover all information needed, the number and logical order of the questions, the appropriateness of questions and options for response.
2. Test the questionnaire to check reliability and validity, topic covering, and appropriate language by a pilot test, and experts' suggestion.

THE DEPENDENT VARIABLE

Student's academic performance was measured by using Cumulative Grade Point Average (CGPA). The following table describes the meaning of each level of CGPA in Thailand:

Table 3 The description of cumulative grade point average

Cumulative Grade Point Average (CGPA)	Description
4.00	Excellent
3.50-3.99	Very Good
3.00-3.49	Good
2.50-2.99	Fairly Good
2.00-2.49	Fair
1.50-1.99	Poor
1.00-1.49	Very Poor
0.00-0.99	Fail

For each department, students were ranked in a descending order according to their CGPAs and separated into five percentiles categories from the top 20 percentile to the last 20 percentile. These percentiles were numbered with 5 scales from 1 (bottom 20 percentile) to 5 (top 20 percentile). Then, matching same percentile of every department by each other and numbered consecutively.

Table 4 The Independent Variables description

Variables	Definition
1. General Information	
Gender	Dummy Variable (1=male, 0=female)
Pay Uni	Who pay for the semester cost for you

- SLS - BRS - Parents pay	- Dummy variable (1=get scholarship, 0=otherwise) - Dummy variable (1=loan grant, 0=otherwise) - Dummy variable (1=parents pay, 0=otherwise)
Night out	How often do you go to discotheque (1=Never, 2= rarely, 3=sometimes, 4=Almost always, 5=Always)
Part Time Job	Do you do a part time job during study (Dummy Variable: 1=Yes, 0=No)
Living status	Living place (Dummy Variable: 1=living with parents, 0=otherwise)
Dorm - Unidorm - Pridorm - Home	Where do you live in the day you have class - Dummy variable (1=University Dormitory, 0=otherewise) - Dummy variable (1=Private Dormitory, 0=otherwise) - Dummy variable (1=Home, 0=otherwise)
Study Habit	- How often do you revise the lesson after class (1=Never, 2=rarely, 3= sometimes, 4=most of the time, 5=Always) - How often do you attend the classroom (1=rarely, 2=sometimes, 3=moderate, 4=most of the class, 5= every class) Range scale is 2 to 10
Interest	How much are you scale your interested in the fields that you study (1=Not at all, 2=Not very, 3= Neutral, 4=Somewhat, 5=Very interest)
2. Family background	
Parent status	Dummy Variable (1= live together, 0 = Separately live)
Father Edu	Educational Level of father (1=illiterate, 2=primary school, 3=secondary school, 4=high school, 5=university and above)
Mother Edu	Educational Level of mother (1=illiterate, 2=primary school, 3=secondary school, 4=high school, 5=university and above)
Family Income	Average family income per month (1=10000-30000, 2=30000-50000, 3=50000-70000, 4=70000-90000, 5=more than 90000)
Family Sup	How much are you considering that your family support you about your study (1=lesser, 2=less, 3=moderate, 4=more, 5= much more)
3. Education background	
THS	Type of high school (1=public high school, 0=private high school)
HSP	Where is your high-school located (Dummy Variable: 1=Bangkok and suburban, 0=otherwise)
HSM	Major that you study when you were in high school (1=Science and Mathematics, 0=otherwise)
HSGPA	Cumulative Grade Point Average when you graduated from high school
4. Peer behavior	
Peer	How often do your close friends attend the classroom (1=rarely, 2=sometimes, 3=moderate, 4=most of the class, 5= every class)

For the range scale, we used likert scale that measure variables. The below table is the meaning of scale.

Table 5 The scale meaning

Variables	Range	Meaning
Nighout	1-5	Student who gets the high score show that he/she often goes to discotheque.
Interest	1-5	Student who gets the high score show that he/she interested in their majors.
FatherEdu	1-5	High score means father has a high education level.
Variables	Range	Meaning
MotherEdu	1-5	High score means father has a high education level.
FamilySup	1-5	Student who gets the high score means that his/her family highly support about his/her study.
StudyHabit	2-10	High score means the student always attend the class and revise the lesson.
Peer	1-5	High score means that student's close friends always attend the class.

Table 6 The criterion of mean score of variable

Mean score	Meaning
Smaller than 50% of the highest of score rank	Behavior or attitude is in the low level
50% of the highest of score rank	Behavior or attitude is in the middle level
Greater than 50% of the highest of score rank	Behavior or attitude is in the high level

DATA ANALYSIS AND STATISTICS USED

1. Descriptive statistics was used for knowing the characteristic of the samples and the variable distribution such as frequency, percentage, mean and standard deviation
2. Checking Multi-collinearity problem by calculating the variance inflation factor (VIF). If the variance inflation factor is greater than 10, that means a multicollinearity problem arises.
3. Quantitative analysis by econometric method, an ordered profit model was used to investigate which factors have an impact on the probability of getting a higher CGPA for the fourth-year undergraduate students in the faculty. The SAS (Statistical Analysis System) software version 9.3 was used to analyze the data in this study.

THE MODEL

In many economic applications the dependent variable is discrete and represents an outcome of decision between a finite set and alternatives. A variety of qualitative response models deal

with this characteristic of the dependent variable (Green, 1993). In this study, a student's academic performance falls in one of the five categories that are naturally ordered.

A common accepted way to model educational performance is to use a production function approach (Ferguson and Ladd, 1996; lioxyby, 1996). That means a function in which the output is a measure of the students' performance and the inputs measure of the factors that affect it. An ordered probit model is a proper method to analyze which factors have impact on students' achievement (CGPA).

In the ordered probit model, the cumulative distribution function of dependent variable distributes normal. Consider the following latent regression:

$$y_i^* = x_i\beta + \varepsilon_i \quad \varepsilon_i \sim N(0,1)$$

$$\begin{aligned} y_i &= 1 \text{ if } y_i^* \leq \mu_1 \\ y_i &= 2 \text{ if } \mu_1 \leq y_i^* \leq \mu_2 \\ y_i &= 3 \text{ if } \mu_2 \leq y_i^* \leq \mu_3 \\ y_i &= J \text{ if } y_i^* > \mu_{J-1} \end{aligned}$$

Where y_i is the observed counterpart of y_i^* ; $i=1,2,\dots,M$

y_i^* is unobserved continuous variable (latent variable)

β is the vector of coefficients to be estimated

x_i is the matrix of explanatory variables

μ_j is the unknown threshold parameter to be estimated along with β

and ε is the disturbance term which is normally distributed with a mean of zero and variance of one (Green, 2000)

In this study, we concerned with how changes in the independent variables translate into the probability of getting a higher observed ordinal dependent variable. The probability that obtaining $y_i = j$ where $j=1,2,\dots,5$ shown as follow:

$$\begin{aligned} \text{Pr ob}(y_i = j) &= \text{Pr ob}(\mu_j < y_i^* \leq \mu_{j-1}) \\ &= \text{Pr ob}(\mu_j < x_i\beta + \varepsilon_i \leq \mu_{j-1}) \\ &= \text{Pr ob}(\mu_j - x_i\beta < \varepsilon_i \leq \mu_{j-1} - x_i\beta) \end{aligned}$$

Therefore,
where F is the cumulative standard normal distribution function.

$$\text{Pr ob}(y_i = j) = F(\mu_j - x_i\beta) - F(\mu_{j-1} - x_i\beta)$$

The effect of the independent variable on the probability of the j th level is given by

$$\frac{\partial}{\partial x} \text{Pr ob}(y_i = j) = \beta[f(\mu_j - x_i\beta) - f(\mu_{j-1} - x_i\beta)]$$

where f is the standard normal density function.

MODEL ESTIMATION

To estimate an ordered probit model, Maximum Likelihood estimation was used to estimate the model. The log-likelihood function is shown below:

$$\ln L = \sum_{i=1}^M \sum_{j=1}^J Z_{ij} \ln[F(\mu_j - x_i\beta) - F(\mu_{j-1} - x_i\beta)]$$

where Z_{ij} is an indicator variable, which equals 1 if $y_i = j$ and 0 otherwise.

Using an ordered probit model, we include all explanatory variables in the model that is shown as follows:

$$\begin{aligned} CGPA_i = & \beta_0 + \beta_1 Gender + \beta_2 Parttimejob + \beta_3 Pr idorm + \beta_4 Home + \beta_5 Livingstatus \\ & + \beta_6 Interest + \beta_7 Parentstatus + \beta_8 Fatheredu + \beta_9 Motheredu + \beta_{10} FamilyIncome \\ & + \beta_{11} THS + \beta_{12} HSP + \beta_{13} HSM + \beta_{14} HSGPA + \beta_{15} SLS + \beta_{16} BRS + \beta_{17} Studyhabit \\ & + \beta_{18} Nightout + \beta_{19} Peer + \beta_{20} FamilySup + \varepsilon_i \end{aligned}$$

From the above model, all variables were added to the model to examine their impact on students' cumulative grade point average.

Results

Table 7 Estimated coefficients from the Ordered Probit Model

Variable	Estimated Coefficient	Standard Error	VIF
Constant	-2.5242***	0.7732	
Students' characteristics			
Gender	-0.0918	0.1841	1.2873
Part time Job	0.4503**	0.2091	1.1832
Pridom	-0.5116**	0.1987	1.4432
Home	-0.4486*	0.2505	1.5751
Living Status	-0.0297	0.2819	1.4750
Interest	0.0752*	0.1046	2.0665
Night out	-0.1396*	0.0827	1.4050
Study habit	0.0846*	0.0581	1.7752
SLS	0.8111	0.5482	1.1150
BRS	0.4780*	0.2705	1.5404
Family status			
Parent status	0.7049***	0.2707	1.2148
Father Edu	0.1906*	0.1063	2.0392
Mother Edu	-0.0754	0.1096	1.9806
Family status (Continue)			
Family sup	0.00251	0.0739	2.8894
Family Income	0.0916	0.0684	1.5694
Education background			
THS	-0.1910	0.2193	1.251
HSP	0.6635***	0.2023	1.3676
HSM	0.4559*	0.2573	1.2398
HSGPA	0.3718***	0.1142	1.7952
Peer Behavior			
Peer	-0.0633	0.0695	2.4188

Note: *, ** and *** show that the coefficients are statistically significant at 10, 5 and 1

percent levels respectively

Table 8 The marginal effects of ordered probit model

Variables	Prob(Y=1)	Prob(Y=2)	Prob(Y=3)	Prob(Y=4)	Prob(Y=5)
Part time Job	-0.1070	-0.0388	0.0010	0.0406	0.1042
Pridorm	0.1216	0.0440	-0.0011	-0.0462	-0.1183
Home	0.1066	0.0386	-0.0010	-0.0405	-0.1037
Interest	-0.0479	-0.0264	0.0003	0.0267	0.0473
Night Out	0.0332	0.0120	-0.0003	-0.0126	-0.0323
Study habit	-0.0991	-0.0583	0.0009	0.0570	0.0995
BRS	-0.1136	-0.0411	0.0011	0.0431	0.1105
Parent status	-0.2091	-0.0809	0.0019	0.0844	0.2037
Father edu	-0.0453	-0.0164	0.0004	0.0172	0.0441
HSP	-0.1577	-0.0571	0.0015	0.0599	0.1534
HSM	-0.1675	-0.0607	0.0016	0.0636	0.1630
HSGPA	-0.0884	-0.0320	0.0008	0.0335	0.0861

CONCLUSIONS

The main purpose of this study is to identify the socio-economic and demographic factors that have impact on the probability of getting higher cumulative grade point average for undergraduate students. The data used in this study was obtained by survey from the fourth-year students of the academic year 2014 at faculty of science and technology of Thammasat University. A total number of samples are 300 students.

According to the results obtained in the table by analyzing data by an ordered probit model, we found that students who were employed (do part time job) during a semester are more likely to obtain a higher CGPA than the students who do not work. It may refer that the students, who work during a semester, are better in time managing and have more responsibility.

Similar to finding of Thompson, Samiratedu, and Rafter (1993), and Araujo and Murray (2010), the students who live in university dormitory have a greater probability of obtaining a higher cumulative GPA than students who live in private dormitory or their home. Therefore, it can be concluded that the university dormitory may provide students the facilities they needed for study and a good environment that can motivate them to study.

The probability of getting a higher CGPA for students who graduated from high schools in the capital and suburban is higher than the students who graduated from schools in other cities. It can be concluded that because high schools in capital and suburban may have the educational facilities, a number of teachers, quality of education, and educational opportunity more than school in the other cities. Moreover, schools in a capital have a higher educational competition than schools in the upcountry, so feeling under pressure of students may encourage them to study hard for having a good grade.

It is obvious that students who graduated from science and mathematics program in high school trend obtain better academic performance than others. Since, this program provides the basic knowledge that is useful for studying in the faculty. And it was clear that the students' interest increase the probability of getting a higher CGPA because more interesting

can refer to more motivating to study.

We also found that the indicator of student performance, CGPA, in high school is a positively significant predictor of student performance in University. That may conclude that basic knowledge of students is important to their study in the University. It may also state that students who have a good study habit, as reflected by a better CGPA, since they studied in high school ought to perform well in the University as well.

Night-out habit is negatively related to the students' academic achievement. It may conclude that night-out habit may affect their wake up time in the morning to attend the class and they may have less time to revise the lessons.

The probability of getting a higher CGPA for students who always attend the class and revise their lessons is higher than the other. It is quite obvious that a studious student ought to perform well in their study.

It is interesting to find that students who pay their tuition fee by student loans are more likely to have better academic performance than students whose parents pay for. It may conclude that student who pay by student loan feels more pressure to getting a job after graduate to be able to pay back for the loans, that motivates them to study hard because they realize that how much the importance of academic performance to get a job.

According to the previous studies, the parents' status is the most important one of familial factors that have impact on a student's academic achievement since parents living together may be stated in a sense of a warm family that would have a positively reflect to children's mild to be ready and have a responsibility in their duty as a student.

The students whose father has a high education are more likely to obtain better academic performance. From this finding, it can be concluded that a high educate father may be a good role model and support about the study for their children in many ways. It is perhaps surprising, however, that an increase on the educational level of mother reduces the probability of getting a higher CGPA, which contradicts the study of many previous studies, moreover, we found that class attendance of their close friend has a negative relationship with student's performance.

From these results that students who have lower CGPA in high school, did not study in science and mathematics program in high school, and graduated from high school in upcountry are less like to get higher CGPA in their bachelor degree than counterparts, we can suggest the ways that the faculty or the university can do to enhance student performance. First, the faculty can provide a test of basic knowledge that students needed for studying in the faculty to the first year students, and provide them a foundation course for students who do not pass the test for adjusting their knowledge before the semester open or add a foundation course likes the compulsory subject during the semester. Secondly, from the results, we can see that students can acquire academic benefits from living at the university dormitory therefore the university should require or encourage students to live at the university dormitory. Moreover, living in the university dormitory may help students improve their study habit for example it is easier to come to the class because it has no traffic, so it may reduce student's class absent, and a good facilities for studying that university provide for example a library, the study room for revise the lesson in the dormitory, and so forth.

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