
Factors Affecting Academic Performance'S Students in the Regular Undergraduate Program Case Study's Faculty of Science and Technology, Thammasat University

Nisachon Ngamprasertsit* & Kannat Na Bangchang**

**Toulouse School of Economics, Universite Toulouse I*

***Department of Mathematics and Statistics, Thammasat University*

ABSTRACT

This research is a study on the factors which have impact on academic performance that consist of social, economic and demographic factors. In addition, one of the most popular measurements is Cumulative Grade Point Average (CGPA). There are collecting from students that are studying in Faculty of Science and Technology, Thammasat University, Rangsit Campus. The research exploits the sample size of 300 from the fourth-year student; the data was collected via questionnaires. Statistical methods used in data analysis are multiple linear regression models by stepwise and ordered probit model. Research results found that the numbers of variables in two methods are almost the same significantly. However, using the ordered probit models give high significance slightly.

Keywords: Cumulative Grade Point Average, Order Probit, Stepwise

INTRODUCTION

Most of countries in the world, university plays a significant role, especially in development country, because of in every field such as economy, society and politics are applied on research. So there are higher education and research institution that provides a specific knowledge in various areas. The main mission of university, in general, is to produce quality graduates and research, to provide the educational services for community, and cultural preservation in area located. Moreover, education is an important factor of human resource development, a country that can develop rapidly in every field because the population has a high level of education. It may also lead to higher individual income, the gross domestic product and economic growth. Therefore, better education should become the first priority because it is an important factor to build and develop thought, behavior and moral of people. Then in developing countries usually have effective educational system but education lacks adequate infrastructure in developing countries. Thailand is a developing country. The educational development 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.

There have been numerous researches studying determinants of students' achievement but there are scarce researches about academic performance of students in Thammasat University. The results of the study will enable the faculty board and professors to realize the factors that affect students' academic performance, and focus on what policies and strategies

that can be employed to improve academic performance in institutions and produce the high quality graduates for the country's development as the mission of the university.

This research will also be a source of reference for other researchers intending to study academic performance of undergraduate students in other faculties or in university level as well.

OBJECTIVES IN THIS STUDY

1. To identify which factors affected academic performance of undergraduate students in faculty of science and technology, Thammasat University.
2. To compare the significance of variables by the stepwise regression model and the ordered probit model

Theory and research relevant

The multiple linear regression model is of the form $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$, where \mathbf{y} is the dependent variable vector, of size $n \times 1$, \mathbf{X} is the matrix of independent variables of size $n \times (k + 1)$, $\boldsymbol{\beta}$ is the vector of model parameters, of size $(k + 1) \times 1$, $\boldsymbol{\varepsilon}$ is the error vector of size $n \times 1$, subject to the condition $\boldsymbol{\varepsilon} \sim N_n(0, \sigma^2 I_n)$, where I_n is an identity matrix of size $n \times n$, n is the sample size, and k is the number of independent variables in the model. Since the essential objective of a regression analysis (Bruce, David, & Richard, 1990) is to arrive at a suitable regression model, which depends on the criteria for selecting variables to be entered in the model, one method that is used extensively is that of stepwise regression.

Stepwise regression is a method for selecting independent variables to be entered into the regression model, by selecting each independent variable that is most closely related to a dependent variable in the regression model. The independent variable entered at each step of the model is checked for its significance. If at any step an independent variable entered into the model is insignificant it is removed. An independent variable entered into the regression model must be tested for its part in explaining variation in the dependent variable. In the case that there are other independent variables in the model (Efroymson, 1960), any independent variable selected for inclusion in the regression model may later be removed if it is found that the variable has no significance. As to specifying the level of significance at which to select an independent variable for inclusion in the model (α_{entry}), with that at which to remove a variable from the model (α_{stay}), these should be specified as of equal value (Smith & Richard, 1981)

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

$$y_i^* = x_i b + e_i ; e_i \sim N(0,1)$$

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

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

y_i^* is unobserved continuous variable (latent variable)

b is the vector of coefficients to be estimated

x_i is the matrix of explanatory variables

m_j is the unknown threshold parameter to be estimated along with b

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

Several related literatures have identified the factors affecting students' academic performance in different academic level (school, college and university) and different place. Most of the studies used the Cumulate Grade Point Average (CGPA) as a common indicator of the students' academic performance. The following section offers brief reviews for those studies.

Ali et al., (2009) studied the factors Influencing Students' academic achievement at University Teknologi MARA Kedah, Malaysia.

Al-Rofo (2010) investigated "the Dimensions That Affect the Students' Low Accumulative Average in Tafila Technical University" in the south of Jordan A sample of 108 students were identified as receiving academic warning by the end of the second semester for the year 2007/2008 because of a low accumulative average.

Araujo et al., (2010) examined the effects of dormitory living on students' academic performance, as measured by grade point average (GPA).

Henry P.H. Chow (2010) studied the predicting academic success and psychological wellness in a sample of Canadian Undergraduate students.

Ryan et al. (2010) studied the impact of lecture attendance on Irish university student's grades.

Olayiwola et al. (2011) studied the impact of socioeconomic factors on students' academic performance.

As the above literature review, all of the research showed that students' academic performance depends on different characteristics' background, socio-economic, environmental factors, etc. Besides, the results are different in each research since there is a difference of culture and education system in each country.

In this case, we have chosen to determine only the factors that we think they are important and match with Thai's culture and custom, and trend to have impact on students' academic performance. Since there is a lack of research about undergraduate students' academic performance in Thailand, this research was undertaken in order to offer some advices to develop the quality of education and student's academic achievement in a developing country like Thailand.

Methodology

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 and whenever possible to draw varied general conclusions from the facts discovered (Lokesh,1984). Survey methods are non- experimental for they deal with the relationships among non-manipulated variables. Since the events or conditions have already occurred or

exist the researcher merely selects the relevant variable for the analysis of their relationships (Best and Khan, 1993). 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.

Population

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.

Sampling Frame

According to the purpose of this study, the data was collected in the Faculty of Science and Technology from the fourth-year undergraduate students in every department of the faculty. Stratified and simple random sampling was employed to collect the data in this study.

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.

Table 1 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 echnology	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 a questionnaire.
2. 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. According to the purpose of study, the questionnaire had both closed questions and scaled questions consisting of the following sections:
 - Student's characteristics including gender, study habit, living situation, CGPA, who pay for the university's tuition fee, how much of interest in the fields that they study, night out habit, part-time job. There are four closed questions, two open questions and three scaled questions.
 - Family background including Parents status, Family income, Father education level, Mother education level, Family support. There are seven closed questions and two scaled questions.
 - Education background including the type of high school (public or private), place of high school, high school major, CGPA of high school when graduated. There are five closed questions.
 - Peer behavior including Study habit of their close friend (class attendance). There is one scaled question.
3. Test the questionnaire to check reliability and validity, topic covering and appropriate language by a pilot test, and experts' suggestion.

Pilot test

The pilot test or pre-testing was used to revise the questionnaire; it was tested with 50 fourth-year undergraduate students, who were not included in the actual study. The purpose of the pilot test is to evaluate the validity and to check the reliability of the questionnaire as described below:

Validity of the Instrument

We checked two issues of the validity: first, face validity of questionnaire that refers to the possibility that the questions or the options in the questionnaire will be inappropriate or misunderstood. The pilot test helped to point out these problems of the questionnaire and identify the weakness in the survey design. Then, the content validity of the instrument was checked by the supervisor and the other experts from the university, to verify if it provides sufficient coverage to the topic, then, we adjusted it as their suggestions. From pilot testing, we found that most of the respondents did not understand well about a score scale in a

questionnaire and some questions were misunderstood. Therefore, we adjusted the scale and language in the questions making it easier to understand.

Reliability of the instruments

Reliability refers to the consistency in repeated measurement, which means it should yield the same results if the questionnaires were done twice by the same samples. We, hence, used test-retest technique, by the pilot questionnaires, twice to the respondents, during a week period, to test the reliability of instrument. Then, using Pearson Product-Moment Correlation coefficient to measure the reliability of the instrument, the results was 0.86, it means that a reliability of the instrument was accepted by expert's recommendation.

Table 2 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	- Dummy variable (1=get scholarship, 0=otherwise)
- BRS	- Dummy variable (1=loan grant, 0=otherwise)
- Parents pay	- 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)
Partime 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	Where do you live in the day you have class
- Unidorm	- Dummy variable (1=University Dormitory, 0=otherwise)
- Pridorm	- Dummy variable (1=Private Dormitory, 0=otherwise)
- Home	- Dummy variable (1=Home, 0=otherwise)
Study Habit	<ul style="list-style-type: none"> - 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) <p>Range scale is 2 to 10</p>
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)
Variables	Definition
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)

Table 3 The scale meaning

Variables	Range	Meaning
Night out	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.
Father Edu	1-5	High score means father has a high education level.
Mother Edu	1-5	High score means father has a high education level.
Family Sup	1-5	Student who gets the high score means that his/her family highly support about his/her study.
Study Habit	2-10	High score means the student always attends the class and revises the lesson.
Peer	1-5	High score means that student's close friends always attend the class.

Table 4 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

RESULTS

Table 5 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
Partime 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
Nightout	-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
Variable	Estimated Coefficient	Standard Error	VIF
Famil Sup	0.00251	0.0739	2.8894
Family Income	0.0916	0.0684	1.5694
Education background			
THS	-0.1910	0.2193	1.2510
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 6 Estimated coefficients from the Multiple Linear Regression by Stepwise

Variable	Estimated Coefficient	Standard Error	VIF
Constant	1.3708***	0.2814	
Students' characteristics			
Gender	-0.01987	0.0711	1.3622
PartimeJob	0.1783**	0.0804	1.2111
Pridom	-0.1566**	0.0766	1.4902

Home	-0.1669*	0.0964	1.6270
Living Status	-0.0439	0.1094	1.6075
Interest	0.0064	0.0453	2.0676
Nightout	-0.0547*	0.0321	1.4862
Study Habit	0.0332	0.0224	2.0793
SLS	0.2959	0.1962	1.1253
BRS	0.1473	0.1047	1.6500
Family status			
Parent status	0.2733***	0.1028	1.2258
Father Edu	0.0652	0.0406	2.1199
Mother Edu	-0.0137	0.0429	2.0533
Family Sup	-0.0190	0.0287	2.5010
Family Income	0.0308	0.0265	1.6748
Education background			
THS	-0.0647	0.0847	1.3013
HSP	0.2240***	0.0761	2.9966
HSM	0.1369	0.0987	1.2609
HSGPA	0.1090**	0.0432	2.0740
Peer Behavior			
Peer	-0.0400	0.0268	2.2488

Note: *, ** and *** shown that the coefficients are statistically significant at 10, 5 and 1 percent levels respectively

According to the result in table 5 and table 6, the variance inflation factors (VIF) are not greater than 10 that mean a severe multicollinearity problem does not exist.

CONCLUSION

The main purpose of this study is to identify the socio-economic and demographic factors that have impact on the getting higher cumulative grade point average for under graduate students.

By using the ordered probit model, we found that the student, who has a part time job, lives with his parents, has an interesting in field that study and attending with class, has a loan for studying, has a good background of his father and has a good grade from high school in science and mathematics program has a high Cumulative Grade Point Average (CGPA) in university, whereas, the student that lives in private dormitory or home and always goes to discotheque has a low Cumulative Grade Point Average (CGPA) in university.

In addition, the stepwise regression indicates that student who has a part time job, lives with his parents and has a good grade from high school has a high Cumulative Grade Point Average (CGPA) in university. The student who has low Cumulative Grade Point Average (CGPA) in university has the same factor as in ordered probit model.

FURTHER RESEARCH

This research concerned in many factors that have impact on the getting higher cumulative grade point average for regular undergraduate students, we suggest who should study in

special program or other faculties, moreover, the other methods or techniques such as the Tabu Search, the Neural Network and the Genetic Algorithm are applied for this data.

REFERENCES

- i. Ali, N., Jusoff, K., Ali, S., Mokhtar, N., & Salamat, A. 2009. "The factors influencing students' performance at Universiti Teknologi MARA Kedah, Malaysia", *Management Science and Engineering*, 3(4):81-90.
- ii. Al-Rofo, M. 2010. "The dimensions that affect the students' low accumulative average in Tafila Technical University". *Journal of Social Sciences*, 22(1): 53-59.
- iii. Araujo, P., & Murray, J. 2010. "Estimating the Effects of Dormitory Living on Student Performance", *The Social Science Research Network electronic library*, [Online] Available: <http://ssrn.com/abstract=1555892>.
- iv. Bruce, L. B., David, A. D., & Richard, T. O. 1990. *Linear Statistical models: an applied approach* (2nd ed.). Boston, USA: Duxbury Press.
- v. Efroymson, M. A. 1960. Multiple regression analysis. In A. Ralston & H.S. Wilf (Eds.), *Mathematical methods for digital computers* (pp. 191-203). New York, USA: Wiley.
- vi. Green, W.H., & Hensher D.A. 2009. "Modeling Ordered Choices". New York: Cambridge University Press.
- vii. Henry P.H. Chow. 2010. "Predicting Academic Success and Psychological Wellness in a Sample of Canadian Undergraduate Students". *Electronic Journal of Research in Educational Psychology*, 8(2), 473-496, [Online] Available: http://www.investigacion-psicopedagogica.org/revista/articulos/21/english/Art_21_413.pdf
- viii. Olayiwola, O., Salawu, O., Oyenuga, I., Oyekunle, J., Ayansola, O., Olajide, J. & Agboluaje, S. 2011. "On statistical analysis of impact of socioeconomic factors on students' academic performance". *IJRRAS*, 8(3): 395-399
- ix. Ryan, M., Delaney, L., & Harmon, C., 2010. "Does Lecture Attendance Matter for Grades? Evidence from Longitudinal Tracking of Irish Students". [Online] Available: <http://cemapre.iseg.ulisboa.pt/events/1e3/papers/Martin%20Ryan.pdf>
- x. Smith, D., & Richard, N. 1981. *Applied regression analysis* (2nd ed.). New York, USA: Wiley & Sons, Inc.