

WHAT FACTORS INFLUENCE FIRST-YEAR STUDENTS' SUCCESS AND FAILURE AT TRU: A CASE OF INTRODUCTORY ECONOMICS COURSES

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ABSTRACT

The likelihood of success and failure in Microeconomics, ECON 1900, and Macroeconomics, ECON 1950, of 1369 Thompson Rivers University (TRU) students was analyzed using a probit model. This approach uses students' final marks in these courses along with other personal and institutional characteristics. It also determines the probability of passing the two introductory courses in economics against alternative contributing factors. The success and failure have found to be influenced by factors such as high school GPA, age, gender, location, type of high school, etc.. In addition, the results indicate that boys have a higher chance of successfully passing Microeconomics while such differentiation between boys and girls was not clearly evident in case of Macroeconomic. Prior academic achievement, measured by the average GPA of some selected high school courses, was also found to be significant. In addition, the likelihood is also dependent on the age of students at the time the course is taken. For a given high school GPA and regardless of student's gender, the highest probability of passing these courses occurs at age 26. Finally, students of both genders who were recruited from the School Districts close to Thompson Rivers University have shown better chances to pass these courses.

INTRODUCTION

The likelihood of success and failure in Principles of Microeconomics, ECON 1900, and Principles of Macroeconomics, ECON 1950, of 1369 TRU students were analyzed using a probit model. TRU students' final marks along with their personal and institutional characteristics were used to determine the probability of passing the two introductory courses in economics. Statistical analyses of the academic performance of university students have been widely used in many empirical studies including Anderson, Benjamin, and Fuss (1994), Smith and Naylor (2005), Birch and Miller (2006), Geide-Stevenson (2009), and Bethune (2010). In order to give a better picture of the performances of TRU first-year student in introductory economics courses, this paper utilizes a probit model in determining the probability of success and failure along with its influential determinants. The structure of this paper is as follows. First, main influences on first year TRU students' performances will be identified. Second, the estimation technique will be explained. Empirical results will then be presented, followed by conclusions and perspectives.

Objectives

The general objectives of this paper are to examine relationship between prior academic achievements in high school and probability of success and failure in the first year of university at TRU. The specific goals of this poster are to identify the determinants of success/failure, the impacts of institutional characteristics, and the influences of Personal Characteristics of TRU students in Introductory Economics Courses.

Model Specification and Data

The likelihood of success and failure in Microeconomics, ECON 1900, and Macroeconomics, ECON 1950, of 1369 TRU² students during 2002 to 2009 was analyzed using a probit model. Students' final marks along with other personal and institutional characteristics are used to determine the probability of passing the two introductory courses in economics. Probability of failure in ECON 1900, and 1950 were applied to the cases when students received a W (withdraw), DNC (Did Not Complete), D (for 50), or F (less than 50). All these cases considered as failure. In the probit model the success and failure of students were related to determinants such as high school GPA, age, gender, possible gap between the time that student was graduated from high school and the time that the course was taken, location of high school, and type of high school. A dummy variable used for location of high school. All high schools within the School District 73 were grouped as TRU main recruitment region. The type of high school was complied according to British Columbia Education Ministry. The high school GPA was calculated based on the average of the available high school academic courses taken by the student. These include principles of mathematics 12 or application of mathematics 12, calculus 12 (if taken), Physics 11, and 12, Chemistry 11 and 12, and English 11 and 12.

LITERATURE REVIEW

The issue of students' success and failures have long been in the centre of education of economics. With a focus on the factors that determine a student's success in introductory economics course, Anderson, Benjamin, and Fuss (1994) have applied ordinary least squares to estimate the student's success in introductory university economics courses. They have selected a total of 6718 students who were enrolled in ECO 100 in two campuses of University of Toronto during winter 1988 and summer 1989. The most important factors found to be significant are achievement level (grade 13 average), the taking of a course in calculus a high school senior students.

Birch and Miller (2006) paper on student outcomes at the Western University in Australia discusses how personal and high school characteristics, as well as university entrance scores

influence students' academic success. They have applied quantile regression to investigate how the effects of these factors vary along the grade distribution. Their research shows that the factors that influence grades have a more pronounced impact on the success of low-achieving students than that of high-achieving students. Factors that were used in their observations include personal characteristics, contemporary work patterns and prior academic achievement (PAA). Studies such as this have also been done in the United States, and these studies have all shown that there is a strong relationship between student outcomes at university and PAA.

Bethune (2010) explored the relationship between attendance and learning in the principles of microeconomics in a small liberal college with a focus on teaching excellence. By using a specific test on student knowledge of economics during the first day of class, and the final examination of the course, and with application of stepwise regression, Bethune found that absenteeism has a significant correlation with learning introductory economics. Further, the student absenteeism has shown strong relationship to course grade.

Geide-Stevenson (2009) has built a model of reduced form educational production function that was suggested earlier by Emerson and Taylor (2004). Students' achievements from Weber State University in the Utah state were formulated as a function of academic ability, student characteristics, number of absences, and membership in the experimental group. The experimental groups were set up according to Gorge and Wasserman (2006). Geide-Stevenson found that more inexperienced junior students found to benefit from graded homework assignments or more individualized feedback.

EMPIRICAL RESULTS

This study analyzes TRU first year students' successes in two introductory courses in economics. Table-1 and Table-2 show the output of the estimated probit model for ECON 1900, ECON 1950 respectively. The GAP variable- the lag of time between the time students was graduated from high school and the time these courses were taken- was not found to be significant. In addition, gender was not significant in principles of macroeconomic. The latter simply indicates that while there is no difference among boys and girls in their probabilities of success or failure in taking principles of macroeconomic, gender of student is important (with 0.10 level of significance) in successfully passing or failing principles of microeconomic. Table-1 presents the estimated probit model for both courses.

One implication of the estimated coefficients of the probit model is to plot a probability response curve. The predicted probabilities may vary with an independent variable. One may put some important and related choices of variables together and predict such probabilities. For the probit model above, suppose we are interested in the effect of gender on the probability of success for boys and girls under specific set of assumptions. In this paper, the following scenarios are discussed.

Table-1 The Estimated Probit Model for both Introductory Economics Courses				
Determinants	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
Intercept	-3.668	1.155	-3.039	1.387
Location	0.1455	0.032	0.0732	0.034
High School GPA	0.4129	0.022	0.2567	0.022
Age	0.2831	0.108	0.2486	0.127
Age Square	-0.0055	0.002	-0.0047	0.0029*
Gender	-0.0554	0.030*	-	-
High School Type _PH	0.0523	0.032*	0.2159	0.0348
High School Type _IH	-0.02351	0.069	0.0232	0.0717*
Log likelihood	-4522.77		-4094.78	
Note: Dependent variable is probability of grades in ECON 1900 and ECON 1950 greater than 55 or C-. Sample size is 1369 students with different available high school GPA in different courses. * indicates significance at the 10% level. The rest of variables are significant at 5% level. High School Type _PH is an indicator of Public high school, and High School Type _IH stands for Independent High School.				

The first scenario is to divide the students into two groups with specific characteristics. Students who were recruited from within the TRU region, i.e. School District #73 and students arrived at TRU from the rest of the province and Canada³. Under this scenario, the probability of successfully passing ECON 1900 for a high school student who graduated either from public or independent school, and was recruited from the S.D.#73 with an average GPA of high school courses is depicted in Figure-1.

As shown in Figure-1, age and such probability are positively correlated. The probability, however, sharply increases at age below 22 and starting to decline after age 26. In other words, the probability of successfully passing microeconomics is at maximum with a 26 years old student's regardless of the student's gender. However, the highest probability goes to the boys with 0.83. At every other level of age, girls with average high school GPA show slightly lower chance to pass this course. Figure-2 shows the probabilities of successfully passing ECON 1900 both for boys and girls who were recruited from the region other than the School District #73. This scenario the same as the first one except the probabilities were estimated for students out of the School District #73. The rest of the assumptions of the first scenario are still valid.

As it is clear, compared to Figure-1 such probabilities are generally lower for students who were recruited from a region outside School District #73. The predicted declining point for the probability is still at age 26.

Figure-1 Probability of Successfully Passing ECON 1900-Scenario#1A

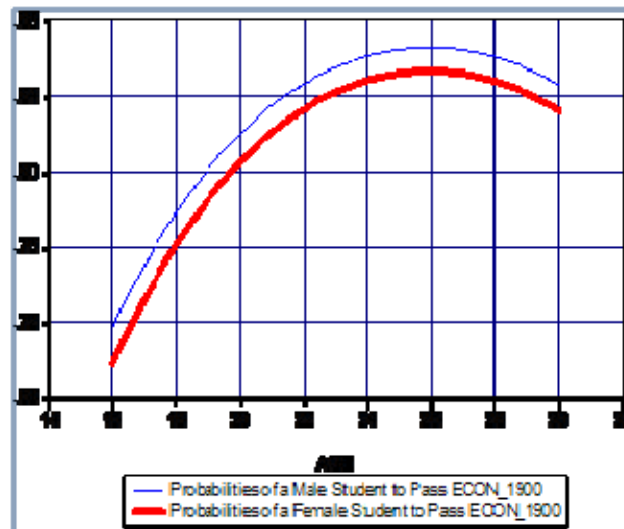
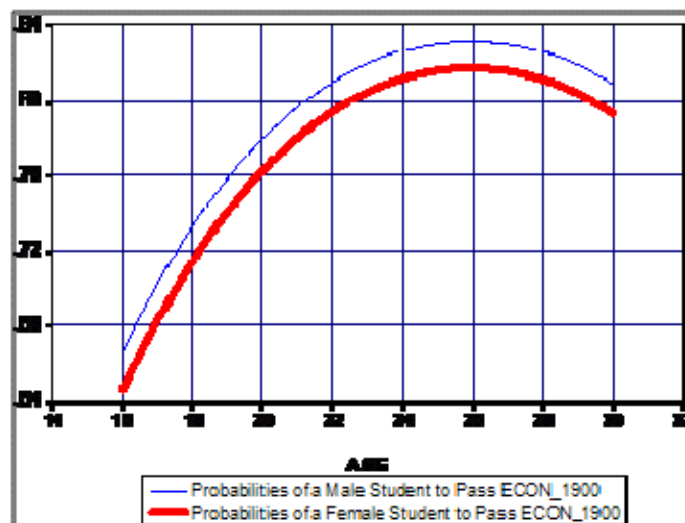


Figure-2 Probability of Successfully Passing ECON 1900-Scenario#1B



In order to examine the impact of high school GPA on the probability of passing ECON 1900, we select students with 26 at which we expect the highest possible success in principles of Microeconomics. Figure-3 and Figure-4 present cases where the estimated probabilities are

depicted against different levels of high school GPA for such students. This has been estimated for both gender and region and named as scenario#2A and scenario#2B.

Figure-3 Probability of Successfully Passing ECON 1900-Scenario#2A

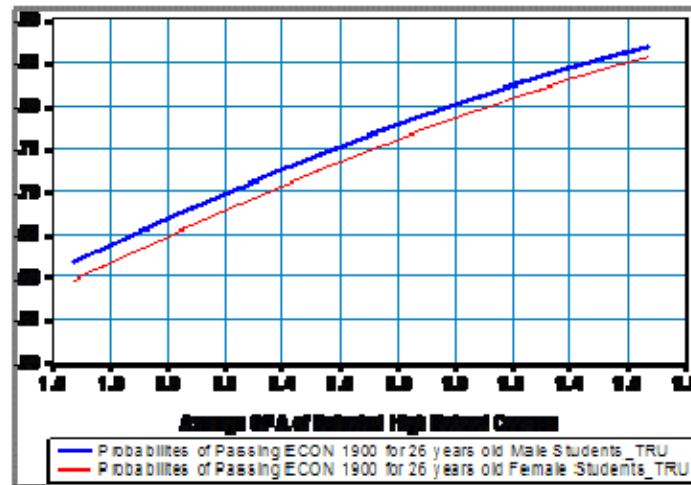
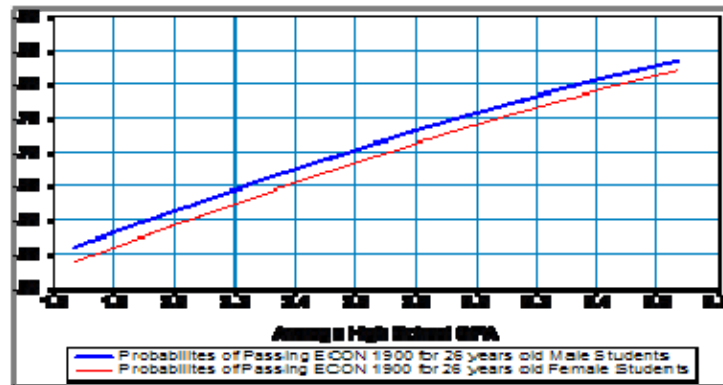


Figure-4 Probability of Successfully Passing ECON 1900-Scenario#2B



The following two graphs show the probabilities of successfully passing ECON 1900 for a typical A+ and C- students who was recruited from within the close vicinity of TRU. The two related scenarios are named Scenario_3A and Scenario_3B. Figure-5 and Figure-6 represent such cases for boys and girls respectively.

Figure-5 Probability of Successfully Passing ECON 1900-Scenario#3A

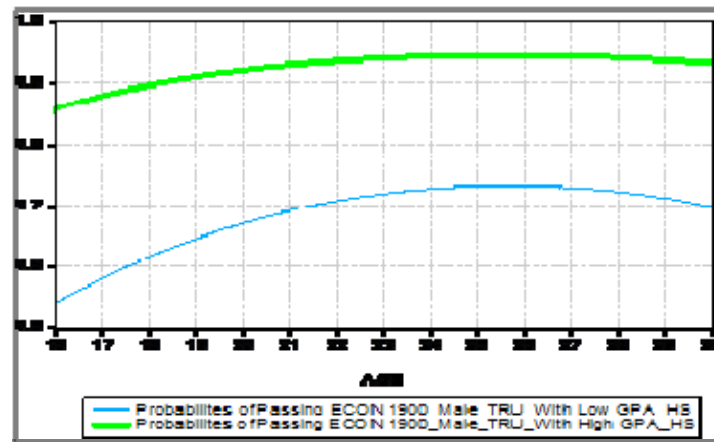
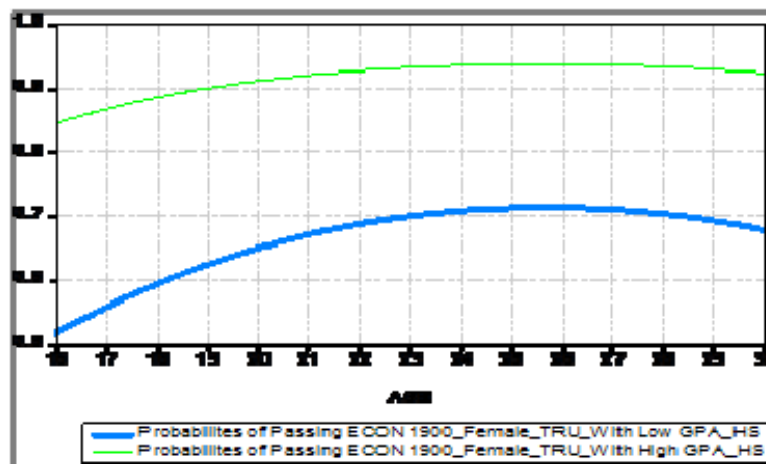


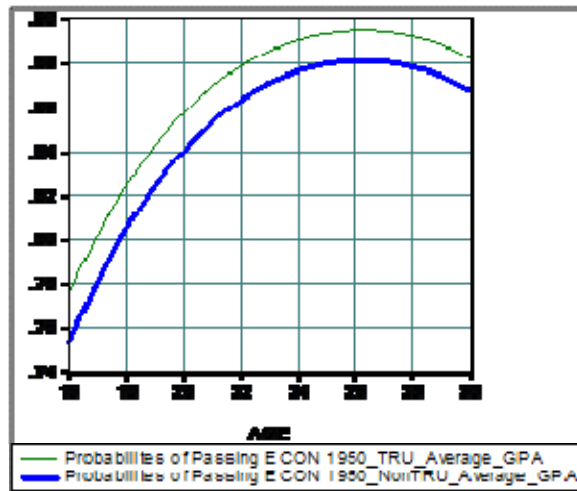
Figure-6 Probability of Successfully Passing ECON 1900-Scenario#3B



For principles of macroeconomic course, we may also want to estimate impacts of all these factors under different scenarios. For the probit model above, we now turn to the effect of students who recruited from within the TRU vicinity and those who have come to TRU from other regions. Since gender was not found to be significant for principles of macroeconomic, the probability of success for TRU and non-TRU high school students under alternative set of assumptions will be explored. Scenario#4 is designed for students with average GPA who have been graduated from either public or independent high schools. Figure-7 represents the

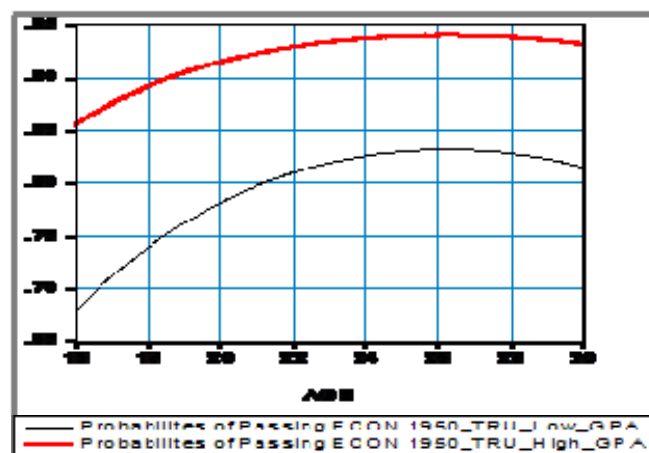
probabilities of successfully passing ECON 1950 for TRU versus non-TRU regions over different range of age for students with an average high school GPA.

Figure-7 Probability of Successfully Passing ECON 1950-Scenario#4



The result indicates that students with an average high school GPA, who were recruited from a region close to TRU, have shown higher probabilities to successfully pass principles of macroeconomics. Such likelihoods can also be estimated for students who had graduated from public and independent high schools close to TRU region. We define Scenario#5 by dividing these students within two groups with low and high GPA. Low high school GPA was set 1.66 and high GPA was assumed to be 4.00. Figure-8 represents the estimated likelihoods for such students.

Figure-8 Probability of Successfully Passing ECON 1950-Scenario#5



Interesting fact here is that students with high GPA who directly comes from a public or independent high school with no gap and with high GPA show very good chance to pass ECON 195, and this chance will stable over higher range of age. Students with low high school GPA, however, will have only 67% chance to successfully pass this course. Older students with low GPA will have the chance to increase their likelihood of passing ECON 195 as high as 84% at age 26. Figure-9 shows the estimated probabilities under scenario#6. Under this scenario the probabilities were estimated for students with the same set of characteristics as in scenarios#5 except they were recruited from a region other than School District #73.

Figure-9 Probability of Successfully Passing ECON 1950-Scenario#6

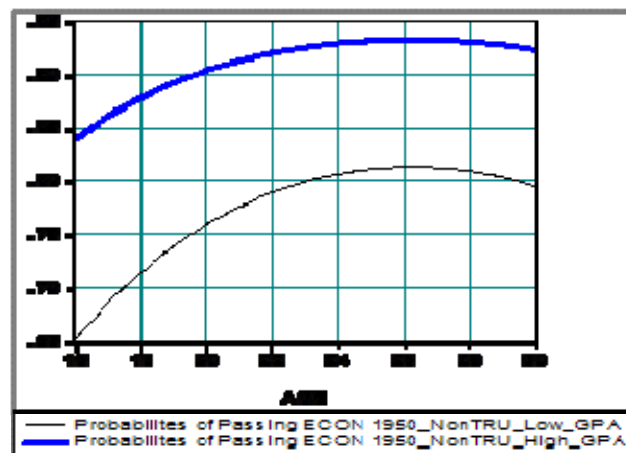
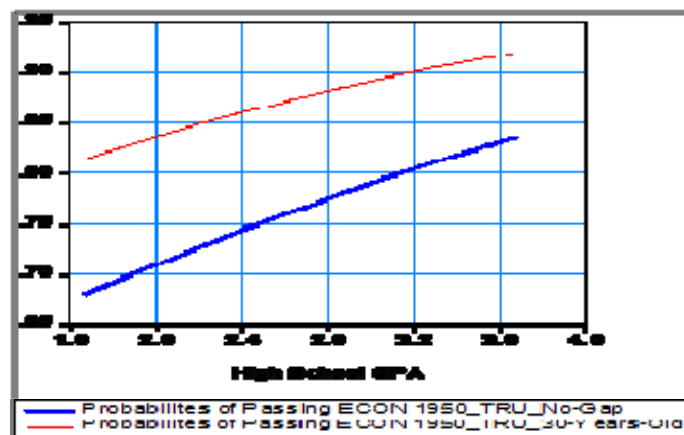


Figure-10 Probability of Successfully Passing ECON 1950-Scenario#7



The final scenario is to estimate the likelihoods of passing principles of macroeconomic for a freshman and a mature student who both recruited from within the TRU region. Figure-10 represents these probabilities for the two groups of students against their high school GPAs. As the graph indicates, a more mature student may pass this course with more than 82% chance even with low GPA. Such chance for a freshman is 63%. Also, as their GPA increases, the difference between the two likelihoods shrinks, indicating that to some degree age and GPA may be considered as complements to each other in passing this course.

CONCLUSIONS

This study utilized a probit model to examine success and failure in two introductory courses in Economics during the first year of study at Thompson Rivers University of Canada for the 2002 to 2009 entrance cohorts. Age, location of the student's high school, previous academic performances measured by the GPA of selected high school courses, and type of high school were found significant in the estimated probit model. Student's gender was only found to be important in principles of microeconomic course. The estimated probit models for both principles of microeconomic and macroeconomic courses were then used to predict the likelihoods of success and failure in these courses under ten different scenarios. The results show that student's average GPA in selected high school courses, being recruited from the region close to TRU, and with no gap after their the high schools are among the most importance determinants for those students most prone to failure in both courses. The results also indicate that male students have a higher chance of successfully passing principles of microeconomics while such differentiation between boys and girls was not clearly evident in principles of macroeconomic. In addition, the likelihoods of success in both courses are also dependent on the age of students at the time the course is taken. For a given high school GPA and regardless of student's gender, the highest probability of passing these courses occurs at age 26. Finally, students of both genders who were recruited from the School Districts close to TRU have shown better chances to successfully pass these courses.

ENDNOTES

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² Data were collected from Thompson Rivers University Institutional Planning and Analysis Office.

³ The region of the students has been divided into S.D. #73 and others. This includes all students who are either from the rest of BC, Canada, or from other countries.

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