What Affects Academic Performance in Bryant University Students?

The Honors Program
Honors Thesis
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ABSTRACT

Looking at a student’s Grade Point Average (GPA) has been the main way of measuring academic success for many years. Of course, GPA is not the only success measure for every person after college, but it is highly relevant. The purpose of this study is to find the strongest factors that affect the academic performance of undergraduate students in Bryant University. The main objective is to provide undergraduate students with information that will help them better understand the variables that positively or negatively affect their GPA. The data for this study was gathered by sending out a questionnaire that contained the various factors that might have an influence on GPA. 200 responses were recorded; however, 64 of them had to be deleted because of missing information. Therefore, the results are derived from a sample size of 136 students. The empirical nature of this study showed that at a 90% confidence level, five factors were statistically significant. As a result, the strongest predictors for academic success (measured in GPA) for undergraduate students in Bryant University are alcohol consumption per week, hours spent studying for one class per week, high school GPA, whether students listen to music while they study or not, and if they have scholarship or not. These results come from multiple regression analyses and stepwise regressions.
INTRODUCTION

Economic growth (especially in the United States) depends on its labor force knowledge to advance its service-based economy. Educational institutions are responsible for delivering knowledgeable individuals that are able to provide solutions in the different sectors of the economy. Human capital is extremely important for businesses because they want to invest in people that will further their objectives. Employers are constantly looking for highly productive workers to increase the economic well-being of their institution and the whole economy in general. The main questions that employers ask when recruiting personnel are: how can we find the best possible talent from colleges? The more educated? The more motivated? One way they can do this is by filtering people with the highest GPAs and interviewing them.

Talent acquisition is regarded as a highly important subject in the labor markets because the most productive human beings are the ones that are able to generate greater returns to the entities they work for. Not only is this information important to acquire the most talented individuals, but it also helps employers analyze the level of wages they need to pay, the benefits that they should give, and the level of work that they could impose. In general, a more productive worker would be paid at a greater rate since they produce more output. When taking into account these observations, students would be extremely interested in increasing their GPA so that they can include it in their resumes. A student with a higher GPA would definitely want to show it to a recruiter in order to increase his/her probability of getting hired.

In real life, a specific formula for a better GPA does not exist. There are a lot of variations in the way that students learn best, how they retain information, what skills they use to grasp theoretical knowledge, and other exogenous and endogenous forces that vary depending on the specific student. However, multiple regression analysis is an extremely powerful tool that helps to determine statistically significant factors that are involved in a certain sample size. By taking a step back and looking at the bigger picture, one can conclude that there is an endless list of factors that could influence the GPA results of a student. Because of this reason, careful decisions backed up by research had to be made in order to thoughtfully select the different independent variables to be included in the regression analysis.
SCOPE, FOCUS, AND METHODOLOGY

This Honors Thesis will be focusing on different factors that influence Grade Point Average scores in undergraduate students in Bryant University. The analysis is based on empirical evidence taken from questionnaires completed anonymously. The questionnaire clearly states that the results are confidential as a measure of control for biases in the responses. For example, people can feel uncomfortable disclosing their GPA, which would possibly make them inflate their responses (this could also occur in the other variables).

With this in mind, there are some important issues and ethical considerations in the type of questions that are being asked. Some questions might be considered too personal and uncomfortable to answer. Some of these might include: parents’ level of income, parents’ level of education, amount of alcohol consumed, and if they have a scholarship. However, different people might feel uncomfortable with other questions like disclosing their high school GPA. Before sending out the questionnaire to students, the Institutional Review Board of Bryant University had to check that it met all of the ethical requirements like making sure students gave consent upon filling out the questionnaire, making sure that the answers were not mandatory, and that the questions were not out of place.

The study will focus on explanatory variables that are commonly found in other literature such as number of courses taken in the semester, amount of hours studied outside of class during the week, sex, number of work hours during the week, hours of sleep per week, and number of office hours per week. However, this study will also look into variables that prove to be of further interest in college like alcohol consumption per week, if students listen to music while they study, if they are student athletes, type of major (business, arts and sciences), what year they are in, and high school GPA. Some additional factors that prove to be important in this study are the parents’ level of education, if they find GPA to be a motivator, and if they have a scholarship. All of these variables will determine a prediction of how GPA (the dependent variable) will react. Multiple regression analysis is an extremely powerful tool that can be used to determine future possible outcomes with statistical power. The process of acquiring questionnaires was done through mass e-mails, spreading it through
group chats, and personal connections. The goal was to get as many responses as possible in order to be able to have greater statistical data to work with.

In the end, 200 responses were acquired; however, some of the questions were omitted since students were hesitant to answer them (most of them were regarding parent’s level of income). Another flaw in the results was that first semester freshman students did not have a college GPA, meaning that this data could not be used in the analysis. Reliable regressions could not have been run if the dependent variable is missing from the data set. After depurating the data, 136 responses were used to carry on with the analysis.

An initial regression containing all of the variables mentioned above was conducted where the only statistically significant variables were high school GPA and if students listened to music while they studied or not. After analyzing the data, some variables were taken away from the regression analysis because some problems of over-controlling were found. For example, hours of study per class per week and hours of study with a tutor per week conflicted with each other. Therefore, they were merged in order to control for total hours of study per week. Furthermore, dummy variables for kinds of scholarship (athletic, needs based, academic) were also merged into whether students have a scholarship or not in order to reduce the level of variation in the study. After further data depuration, other regressions were estimated (one including all of the variables) and another step-wise regression in order to determine which were the most influential variables in the model.
VARIABLES INCLUDED IN THE MODEL

The following list shows the variables that were included in the regression analysis:

- **Gpa**: it is the dependent variable measured on a scale from 0 - 4
- **Totalstud**: total study hours for 1 class per week (outside of class, including tutoring from the Academic Center for Excellence)
- **Female**: binary variable that equals to 1 if the subject is female and zero if male
- **Senior**: binary variable that equals 1 if the subject is a senior, 0 otherwise
- **Junior**: binary variable that equals 1 if the subject is a junior, 0 otherwise
- **Sophomore**: binary variable that equals 1 if the subject is a sophomore, 0 otherwise
  - If 0, it means that all of them are being compared to the freshman subjects
- **Athlete**: binary variable that equals 1 if the subject is a student athlete and 0 otherwise
- **Business**: binary variable that equals 1 if the person is in the college of business (accounting, finance, management, information systems, marketing), 0 if the subject is in the college of arts and sciences
- **Scholarship**: binary variable that equals 1 if the subject has a scholarship and 0 if not
- **Workhrs**: number of hours spent on a job per week
- **Sleephrs**: number of hours that the subject sleeps per day
- **Parenteduc**: parents’ level of education (12 years = high school, 14 = associate’s degree, 16 = college, 18 = master’s, 21 = PhD)
- **Hsgpa**: subject’s GPA in highschool
- **Music**: binary variable that equals 1 if the subject listens to music while they study and 0 otherwise
- **Flozalc**: fluid ounces of alcohol consumed per week
- **Income**: parents’ highest level of income
- **Doublemajor**: binary variable that equals 1 if subject pursues a double major and 0 if not
- **International**: binary variable that equals 1 if the subject is not from the United States and 0 if they are
- **Totalstud2**: total study hours for 1 class per week squared (to capture the decreasing marginal returns to GPA)
Model

\[ Gpa = \beta_0 + \beta_1 \text{totalstud} + \beta_2 \text{female} + \beta_3 \text{senior} + \beta_4 \text{junior} + \beta_5 \text{sophomore} + \beta_6 \text{athlete} \\
+ \beta_7 \text{business} + \beta_8 \text{scholarship} + \beta_9 \text{workhrs} + \beta_{10} \text{slephrs} + \beta_{11} \text{parenteduc} + \beta_{12} \text{hsgpa} \\
+ \beta_{13} \text{music} + \beta_{14} \text{flozalc} + \beta_{15} \text{income} + \beta_{16} \text{doublemajor} + \beta_{17} \text{international} + \beta_{18} \text{totalstud2} + \text{error} \]
LITERATURE REVIEW

Introduction

It is important to highlight the difference between the studies made for academic performance and its influence on the labor market after students attended college. For example, many studies would include GPA as an explanatory variable in order to explain income levels in the first job they acquire. However, this Honors Thesis is more focused on the pre-entry to the labor force. Therefore, GPA is the dependent variable of interest that could be affected by a variety of factors. The findings for this subject are extremely important because students can figure out how to maximize their GPA in order to be able to compete in the labor force.

With this being said, the literature research for this project is focused on looking at GPA as a dependent variable with a variety of factors included in different studies. This Honors Thesis brings together the most influential factors found in the research into one multiple regression analysis that shows the most significant variables. It is important to mention that this study is conducted in Bryant University in Smithfield, Rhode Island. Some extra pertinent information to be aware of is the specific facts that surround this university. For example, Bryant is in the No. 10 position for Regional Universities in the North according to the U.S. News and World Report 2019. The median first year starting salary for previous classes was about $59,000. In 2017 and 2018, international students made up 8% of the population in this university. Furthermore, Bryant University’s acceptance rate is 72.3%. With this information in mind, a deeper understanding of the results can be derived.

Research on the academic performance topic is widely typical. Therefore, significant information for this Honors Thesis was focused on the validity of using self-reported GPA as a determinant of academic success, some psychological factors that might affect students, and qualitative and quantitative determinants of grade point average scores. Furthermore, the influence of alcohol and music are important topics to touch upon since the results showed significance with these variables. Finally, literature on the connection of GPA and the labor market will help connect the dots on its importance for students’ future.

Validity of Self-Reported GPA
One of the main concerns that is imperative to address in this Honors Thesis is the validity of self-reported data; especially regarding GPA because it is the main variable of interest. Nathan Kuncel, et al. mention that self-reported GPA is a variable that is constantly used in educational studies in which special caution should be used to in order to safely deal with the results used in empirical studies. Because it is more complex to obtain school transcripts, self-reported GPA is one of the more convenient way of obtaining this data. The research on Kuncel’s study mentions that some of the variations from self-reported and actual GPA could be represented by random errors in which students could not remember their cumulative grade point average. However, this kind of error is not too significant if self-reported GPA is being used as an applied study rather than making decisions with the information (like deciding to put students in certain classes according to their performance). Furthermore, people might tend to inflate their GPA values because they want to show they have performed better in college even if the answers are anonymous and nobody is going to pinpoint the grades to different students. Therefore, in statistical terms, an upwards bias towards higher GPA would be concerning but not to the point that the data is not reliable. Therefore, variance would not be too concerning because the factor would usually have an upwards tendency (researchers would rather have a consistent variation than just variation all over the place because students would not under report their GPA).

Kuncel’s et al. study concludes that in general, high school GPA is not reported as well as college GPA possibly because of differences in the use of GPA calculations. There were no considerable differences in the validity of self-reported GPA between male and female subjects from the study with 60,926 subjects. In general, “lower levels of school performance are associated with considerably lower levels of reliability for self-reported grades” (Kuncel, et al. 74). This result shows that lower reported GPAs in the study could be a weakness because students with lower actual GPAs are the ones that tend to inflate their grades.

Biases in empirical studies can be understood by taking a dive into the behavior of human beings that help explain these variations. The theory of self-concept and self-esteem is extremely influential in the decisions that people carry out in a day to day basis. Self-concept is described as “the degree to which people have an internally consistent and confident
assessment of themselves”; while self-esteem is “the global self-evaluation that transcends specific aspects of a person’s self-concept” (Vallacher). This information is important because everyone’s self-evaluation could be affected by how individuals think they are seen by other people. Interaction with others and self-awareness have an influence on a person’s actions and their appearances. For example, there could be biases in how people consider themselves as being good test-takers, having good study habits, and knowledge in general. This bias could be controlled by separating people’s responses from group environments into more personalized areas. Usually, subjects hesitate to answer questions that would compare them to other people because of the self-concept and self-esteem theory.

Psychological Factors

In his study, Ken Dunegan describes how GPA “has been correlated with critical thinking skills, cognitive abilities, and general mental abilities, and is often perceived as an indicator of motivation and conscientiousness” (239).

This is the reason why employers usually use a minimum GPA cutoff when deciding which possible employee to hire in their institution. Dunegan’s journal publication shows the connection between GPA and critical thinking skills through “framing effects”, a decision making phenomenon. In the research, Dunegan conducted two experiments in which he framed questions (that have the same final meaning) with a positive and a negative frame. For example, saying that beef is 75% lean is the same as saying that the same beef is 25% fat; the two phrases have the same meaning, but are presented in positive and negative perspectives, respectively (Dunegan 239). The study found that people with higher GPAs were more susceptible to biases in positive vs. negative frames because they might be taking into account the positive and the negative issues presented. On the other hand, people with lower GPAs were not as sensitive when reaching conclusions between positive and negative frames. In the end, Dunegan concludes that people with the higher GPAs are not necessarily the least biased or the most objective in their decision making (245). However, more research on this bias topic is needed in order to describe significant relationships in attribute framing decisions.

In Barbara Karwacinski’s study, the psychological well-being factors like autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and
self-acceptance on freshmen college students were used to reduce the gap that only focuses on traditional predictors of GPA. The traditional predictors of GPA include the different cognitive factors (such as ability and academic involvement) and non-cognitive factors like affective variables. She mentions how students might feel discouraged after getting the results of their college GPA, leading them to make decisions of dropping out because they might not feel prepared for the college experience. When controlling for these 6 factors, parent’s level of education, different ethnicities, gender, and age; Karwacinski found that for each point higher in high school GPA, the freshmen GPA increased by about 0.79 at a 95% confidence level. Also, the most significant factor from the 6 psychological well-being factors was the positive relations with others which showed that for every point (in the Likert Scale), the first year students’ GPA increased by about 0.18 with a 90% confidence level. The other factors were found to be statistically insignificant. Lotkowski et al. mention that “academic self-confidence and achievement motivation had the strongest relationship in college GPA. Financial support, academic goals, academic-related skills, social involvement, institutional commitment, and social support had a moderate relationship to GPA. Institutional size nor selectivity had a relationship to GPA” (8). These non-academic factors represent a key role in college retention and performance because students feel they can establish stronger friendships. Relationships with people that have the same interests (e.g., those with strong academic orientations) tend to have stronger academic performance. Also (like other studies have mentioned), high school GPA and standardized test results have a strong relationship to college cumulative GPA since previous performance could be shown in higher level education.

Qualitative and Quantitative Determinants
Hamid Tabesh and Dawn Hukai conducted research on the qualitative determinants of undergraduate academic performance in the University of Wisconsin-River Falls. This approach is extremely desirable in the research for factors that affect GPA because it provides insight of the factors that are not as specific and quantifiable. Some of the important control variables that are included in this study are sex, parents’ level of education, if the subjects have kids, and if they attend tutoring (this usually occurs after students realize they have not done well when looking at their grades). The results found in this study were mostly
significant at the 90% confidence level. Males were found to have 0.104 lower GPA than female subjects. People with no kids were found to have 0.23 lower GPA than people who had kids. This could be explained because students with children usually are more focused and motivated than those who do not have children; but they are subject to greater distractions. Students who had more than $10,000 in loans and grants suffered a 0.17 lower GPA than their counterparts. This definitely plays a role into whether students have scholarships or not (if they are less liable for meeting debt payments, they would potentially have higher GPA). Two interesting variables that were discussed in this study were the number of deliberate study hours in which “it has been found that no more than 4-5 hours per day of deliberate practice may be undertaken without the risk of burnout” (Tabesh & Hukai 30). Therefore, a significant non-linear relationship is established. However, it is important to include a variable that tries to determine the quality of study because more study time does not equal higher comprehension. The second interesting result was that students who used a tutor were likely to have a lower GPA by 0.22 than those who did not since “there may be a lagging effect on this variable” (Tabesh & Hukai 30).

Camille Legaspi et al. conducted an academic research paper in the University of Cal Tech San Marcos with a sample of 100 where they asked about work hours, classes taken, study hours, living arrangements, motivation of getting a higher GPA, plans after graduation, and the importance of getting a 3.0 or higher. The results on this study were not statistically significant. However, its information was useful in order to determine some typical quantitative and qualitative factors to include in a multiple regression model. It is important to look at the F statistic in order to determine whether or not the whole model has some predictive power. This study represented an F statistic p-value of 0.3944 > p-value of 0.05 and even 0.10. These kinds of variables will be represented in the results of this Honors Thesis regression results; which are equally insignificant. One explanation for this faulty model could be the fact that there are few factors that help explain the variations in cumulative GPA and also the fact that the sample size is somewhat small.

Another important independent variable that might affect undergraduate students’ academic performance in college is the level of student-faculty interaction. Kelly Talbert from the
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University of Oregon included control variables such as degree aspiration, race and ethnicity, first generation status, social class, and gender. An extra variable that was included was the socio-economic status of the subjects’ family. An increase in tuition and insufficient aid can strongly affect a student’s college experience (even taking into account buying/renting books that are expensive). The study showed that students of higher social classes were a bit more likely to connect with faculty outside of class (19.3%) than those in the middle class (11.7%) or low income (16.8%) (Talbert 57). Faculty accessibility was very important for non-first generation students (but time spent with professors after class was more appreciated by first generation students). These results could be due to uncertainty and nervousness of approaching professors. Looking into office hour attendance and parents’ income are interesting factors to look at, but after conducting the multiple regression analysis and stepwise regression in this Honors Thesis, those factors concluded to be statistically insignificant.

Influence of Alcohol

As many people know, alcohol consumption in college is very common; therefore, this is a very important factor to consider when looking at its influence on overall academic performance. Samuel Acuff et al. conducted a meta-analytical research on this subject in which they found that heavy drinking is negatively correlated with academic aptitude. In general, students “who frequently binge drink are almost 17 times more likely to miss a class and 8 times more likely to fall behind in schoolwork than those who do not drink” (Acuff et al. 413). The reason for this is that alcohol strongly affects people’s cognitive abilities. In the future, frequent alcohol users may face poor career outcomes. This study focuses on three variables that have explanatory power over alcohol consumption and academic performance. The first factor is the use of Protective Behavioral Strategies (PBS) where students would limit the number of drinks in one sitting, having a designated driver, and avoiding drinking games. These kinds of strategies can strongly reduce the personal and societal harms as a result of alcohol consumption. The second variable is Delay Discounting which is when a person devalues the consequences of consumption as a function of time. For example, students usually look into their near future in which they look for immediate social rewards and comfort. The third variable that this study looks into is the Consideration of Future
Consequences which is characterized by the tendency to weight present and future outcomes when students make a decision.

The descriptive data showed that students of 18-19 years of age consumed about 17 standard drinks per week. The final results of the study showed that Protective Behavioral Strategies did not have enough significance to be able to predict GPA scores. However, Delay Discounting and Consideration of Future Consequences significantly predicted GPA (at a 95% confidence level). These two variables are the most significant because “students who value their future and organize their behavior around distal outcomes can experience academic success despite relatively heavy drinking” (Acuff et al. 416). When students engage in delay discounting and considering their future consequences, they realize that they would want to improve their GPA in order to enter highly competitive job markets or to get into graduate schools.

In Jennifer Read’s et al. study, they used the Young Adult Alcohol Consequences Questionnaire (YAACQ) in which the final scores proved to be an early indicator of academic performance at the end of the semester for college students. 8 consequence factors are assessed in this study in which they look at social/interpersonal, academic/occupational, risky behavior, impaired control, poor self-care, diminished self-perception, blackout drinking, and physiological dependence. The most important domain of focus for this Honors Thesis is the academic/occupational in which students might neglect their obligations due to the influence of alcohol. The Read et al. study found that for a p-value < 0.01, higher scores on the YAACQ would decrease final semester GPA by 0.23 points. The factors that have the more weight in these results are binge drinking frequency, quantity, and blackout drinking. An interesting evaluation that could be done further is to analyze whether alcohol’s consequences actually bring a self-change to student’s behavior once they realize that it strongly affects their GPA. “Early identification of these consequences may be incorporated into individualized feedback interventions geared toward the reduction of continued risky drinking and consequences, both during college, and in the years beyond” (Read et al. 2608). This is an important point because students can curb their drinking behaviors once they realize the amount of damage that alcohol produces on their academic performance.
Williams et al. conducted research in order to determine if alcohol consumption reduces the level of human capital accumulation. They mention that one of the best measures of alcohol consumption would be the amount of drinks consumed in a given occasion (over a period of time). One of the most obvious ways of determining how drinking can affect GPA is by determining the allocation of time that students spend drinking rather than studying. Also, it is imperative to mention that hangovers and lack of rest and sleep due to drinking further affects students’ ability to study. In this study, human capital accumulation is measured by the amount of time that students spend on reading, going to lectures, and other study factors. Furthermore, the researchers strongly connect GPA to level of capital accumulation. In this study, every hour spent studying reduces alcohol consumption by about 0.73 of a standard drink. On the other hand, five additional drinks per occasion reduces the GPA by half a letter grade.

Influence of Music
The influence of music on GPA was included in this Honors Thesis because it is the type of media that students usually use in tandem with their school work. Other types of media like video, social networking, and texting are also important in order to determine their effect on GPA. However, music was chosen because it is one of the factors that is not as distracting as videos, social media, and texting. Jennifer Walsh et al. touch upon the subject of different media use of women in the first year of college and its relationship with GPA. The study found that women reported 11.8 hours of media use per day in which the ones used the most were music, texting, and the internet. The results of this study supported the expectations that higher media use negatively affected academic performance since it is related with lower academic behaviors. Interestingly, listening to music was positively associated with higher academic outcomes. The study mentions that “although there is some evidence that music may interfere with comprehension, it may also make studying more appealing” (Walsh et al. 229). This could further be explained if students use music that they find more appealing rather than music they do not usually listen to. More information needs to be found on the positive effects of music on GPA because it is common to find that music negatively affects due to the lack of comprehension of the study materials.
Economic Implications
As mentioned in the introduction, higher academic performance would be of great interest to graduating students because they would get higher returns from showing they have had greater cumulative GPA. A study was conducted in order to look at the relationship that GPA has on income after college for the first job and five years into their professional careers. It was found that GPA was highly significant at the one percent level (p-value). Grades to earnings relationship is significant to both men and women in the labor force and the study found sufficient evidence that supports higher GPA returns for the first job after graduation and after five years. “Consistent with the human capital hypothesis, higher grades enhance earnings regardless of the firm’s level of worker investment” (Jones & Jackson 264). In their study, Jones and Jackson describe that grades already show productive capacity for the labor force even before firms start investing in worker training to increase human capital.

A very important aspect to consider is if the influence of GPA diminishes in the long run. If this is the case, human capital cannot be determined by measuring GPA and therefore employers should not look at this measure to determine higher output from their workers. However, more research has to be conducted on this area. In Paul Oehrlein’s study of Determining Future Success of College Students he found that college GPA is an extremely significant determinant of future income (with a significance level of p < 0.01). It was also found that every point increase in GPA will lead to a $2,900 increase in salary per year. “An A student will make approximately $2,900 more than a B student and $5,800 more than a C student every year” (Oehrlein 66). It is clear that employers judge potential employees by their GPA and those students with a higher measure would get better paying jobs.
DATA

As mentioned before, the full 200 responses from the questionnaire could not be used because some subjects skipped questions (most likely because they felt uncomfortable answering parents’ income, parents’ highest level of education, etc). Other responses were missing the dependent variable because first semester Freshman students did not have a GPA. After depurating the data, 136 responses were left. Figure 1 below shows the descriptive statistics for the numerical data that was used in the study.

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|}
\hline
\text{Descriptive Statistics} & \text{gpa} & \text{numcourses} & \text{workhrs} & \text{sleephrs} & \text{parenteduc} & \text{hsgpa} & \text{flozalc} & \text{income} & \text{totalstud} \\
\hline
\text{Mean} & 3.49 & 5.27 & 7.15 & 6.95 & 16.85 & 3.55 & 6.18 & $181,265 & 5.12 \\
\text{Median} & 3.5 & 5 & 7 & 7 & 16 & 3.6 & 4.2 & $100,000 & 4 \\
\text{Mode} & 3.4 & 5 & 0 & 8 & 16 & 4 & 0 & $100,000 & 2 \\
\text{Standard Deviation} & 0.35 & 0.74 & 7.94 & 1.15 & 2.98 & 0.37 & 7.26 & $272,702 & 3.63 \\
\text{Kurtosis} & 0.60 & 2.17 & 3.91 & 0.00 & 3.81 & 2.79 & 3.96 & $29 & 3.74 \\
\text{Skewness} & -0.76 & -0.48 & 1.56 & -0.58 & 1.55 & -1.17 & 1.95 & $5 & 1.70 \\
\text{Range} & 1.8 & 5 & 45 & 5 & 14 & 2.2 & 33 & $1,980,000 & 21.27 \\
\text{Minimum} & 2.2 & 2 & 0 & 4 & 12 & 1.8 & 0 & $20,000 & 0.2 \\
\text{Maximum} & 4 & 7 & 45 & 9 & 26 & 4 & 33 & $2,000,000 & 21.47 \\
\hline
\end{array}
\]

Average GPA was at 3.49 out of a 4.0 scale with most students taking about 5 courses per semester. It is clear that high school GPA on average is 0.06 points higher than the one at college. The data shows that the average student at Bryant University would work at a job for about 7 hours per week, sleep almost 7 hours per day, study 5 hours for one class per week (including going to tutoring), and attend 5 classes per semester. Average parent’s income was found to be $181,265 per year. It is important to note that there is a considerable amount of variation in this explanatory variable by having outliers of $20,000 and $2,000,000 which affect the mean with a sizable standard deviation. The parents’ highest level of education averaged at 16 years which means most parents have at least a college degree. The average consumption of alcohol measured in fluid ounces is 6.18. The measure of fluid ounces of alcohol was derived from the fact that every standard drink (1 shot of hard liquor, 1 glass of
wine, or 1 beer) has 0.6 fluid ounces of alcohol. Therefore, 6.18 fluid ounces of alcohol translates to an average of 10 shots of hard liquor, 10 glasses of wine, and 10 beers per week.

GPA, number of courses per week, hours of sleep per day, and high school GPA are all negatively skewed which means that the values for these factors tend to be concentrated on the higher measures. On the other hand, hours of work, parent’s education, fluid ounces of alcohol, and total study hours per week are positively skewed which means that majority of the responses are concentrated in lower values.

The qualitative data shows that 55% of the sample were males. 72% of this sample size is enrolled in the college of business at Bryant University (which has been a very strong differentiating factor for this university over the years). Only 12% of the sample were student athletes. Furthermore, 71% of the respondents were native-born American students which means that 29% were international (19% more than Bryant’s average international student demographic). 33 respondents of the 136 people mentioned that they are pursuing a double major. Please refer to Appendix 1 for a visual representation of these factors. Figures 2, 3, and 4 below show important data in the sample.

*Figure 2.- Percentage of Students by Year*
Figure 3. Percentage of Students that Listen to Music while they Study

Figure 4. Percentage of Students with a Scholarship
Unfortunately, many Freshmen responses had to be taken out of the sample because of the missing dependent variable. This is why only 7% of the subjects were Freshmen (which makes the comparison between students from different years harder). In the regression, the Freshmen was the class from which all other upperclassmen were going to be compared to. Therefore, a lack of data on this demographic affects statistical significance of these factors. More than half of the students in the study listened to music while they study which is a significant factor that definitely affects the results. Only 13% of the subjects did not receive any kind of academic, athletic, or needs based scholarship in order to attend college.
RESULTS

The table of correlations in Appendix B shows a variety of correlations from the different factors included in the model. Only the strongest correlations were marked with color (blue for negative correlations and green for positive correlations). However, the most important variables that we are going to analyze are the ones strongly correlated with GPA. In this case, both high school GPA and students with a scholarship have a relatively strong positive correlation which means that an increase in those factors would also cause an increase in GPA. On the other hand, music is shown to be negatively correlated to GPA meaning that listening to music while studying would decrease GPA. After understanding the correlations, three different multiple regression models were created in order to understand how the different explanatory variables interact with the dependent variable. The first model was conducted with the inclusion of all of the variables mentioned earlier. The second two models are results of stepwise regressions estimated to gauge the independent variables that have the most influence on the dependent variable.

It is important to mention that in the three models, the F-statistic; which measures if a group of variables are jointly significant, showed a value of 0.000 which is less than the 0.05 benchmark for significance. This means that all of the variables included in the three models have some kind of effect on the dependent variable GPA. The adjusted $R^2$ of the three models are 22.90%, 22.24%, and 24.96% accordingly. These values show that the models have relatively low predictive power since they can predict 22.90% of the variations in GPA relative to the changes in the explanatory variables (22.24% in model 2 and 24.96% in model 3).

In model 1 in Appendix B, most of the values were found to be statistically insignificant because their p-value was not even lower than 0.10 (90% confidence level). In fact, many values were found to be highly insignificant like gender, hours of work per week, parents’ level of income, and parents’ education. However, the factors of listening to music while studying and high-school GPA were highly significant with p-values lower than 0.01 which translates to a 99% confidence level. Total hours of study per week was found to be significant at the 90% confidence level with p-values lower than 0.10.
Like other results found in research literature, high school GPA seems to be a significant driver of stronger college GPA. The results from this regression show that for every point higher in high school GPA, a student could find an increase of 0.28 points in college. This can be explained by the fact that even academic success in college can be predicted with the use of academic performance in high school. It seems that this motif feeds into future predictions. Higher academic success in high school brings greater success in college, while this thesis also tries to show that academic success in college can be translated into success in the labor force. The other explanatory variable that was found to be highly significant was if students listen to music while they study. Comparatively, students that listen to music while studying have 0.19 less points in their GPA than those who study without music. The reason for this is that music, like other kinds of media, tends to distract people that try to concentrate at the same time. Music stimulates a person’s hearing sense which diverts the brain’s attention from solely concentrating on school work.

An extremely interesting finding in the first model was that the result for the total hours of study for one class per week (including tutoring sessions) showed a negative value. If one were to interpret the coefficient of this variable as it is, it would say that for every hour of study, a student’s GPA would decrease by 0.01. This result is obviously conflicting and counterintuitive because studying is what helps students grasp the concepts of the class. Therefore, an extra variable had to be added. The new variable is total hours of study for one class per week squared (totalstud^2). This was done in order to capture the phenomenon of marginal diminishing returns to GPA relative to hours of study. When this was done, the coefficient for total hours of study per week changed to the following values:

\[
0.0202209 \times \text{totalstud} - 0.002066 \times \text{totalstud}^2
\]

These coefficients were used to construct Graph 1 below; a negative quadratic function with time intervals of 30 minutes. Then, the following equation was used to calculate the turning point where extra hours of study negatively affect GPA.

\[
\text{GPA} = \frac{\beta_1}{2 \times \beta_2} = \frac{0.0202209}{2 \times -0.002066} = 4.89
\]

This equals to 4 hours and 53 minutes of total study for one class per week.
Academic Performance of Undergraduate Students in Bryant University
Honors Thesis for Emilio Avalos

Graph 1.- Marginal Returns on GPA

This result helps to corroborate the literature that mentions that the optimal amount of study per class is from four to five hours. As it can be seen in the graph, extra hours of study per class past the 4.89 hours makes GPA decrease. This can be explained by the fact that students would not retain any more information and those extra hours are useless and harmful to academic performance. At the highest point, for 4.89 hours of study GPA would increase by 0.05. If the average amount of study hours per week in this sample (5.12) is included in the derivative of the quadratic function, then:

\[ \frac{\Delta \text{GPA}}{\Delta \text{Total Stud}} = 0.0202209 - (2)0.002066(\text{total stud}) = 0.005909 - (2)0.002066(5.12) = -0.00093. \]

This shows that the sample of students tends to study for more time (which is just about 15 more min than what they could maximize. This would bring their GPA down by 0.00093 points. It is not such a big value but it still shows that the diminishing marginal returns to GPA occur.
After looking at the results from the first model, the second and the third models were developed with stepwise regressions. This statistical approach consists of adding variables one by one in order to determine the most influential on the dependent variable. In this case, the second model shows the previously stated variables to be highly significant at a 95% confidence level. The other variable that showed strong influence on GPA was consumption of alcohol per week. This variable is significant at a 90% confidence level and has a coefficient of -0.00652. This means that for every fluid ounce a student consumes every week, their GPA falls by 0.00652 points. The negative relationship between alcohol and GPA is shown in previous studies since greater consumption can lead to lower time spent studying due to: sacrificing study time to drink, not being able to do work while hungover, missing classes, and damage to brain cells. The descriptive statistics of this study show that the average amount of fluid ounces of alcohol that students consume per week is 6.18 fl.oz; which translates to about 10 standard drinks (10 cans of beer, 10 shots of hard liquor, or 10 glasses of wine per week). A semester has 15 weeks so along the semester a student would have consumed 92.7 fl.oz of alcohol which we would then multiply by the coefficient -0.00652 and get a result of -0.604. In one semester, the average student from this sample could negatively affect their GPA by 0.604 points which would potentially bring a 4.0 student to 3.4, a full letter grade decrease.

The third regression that was conducted in this thesis added scholarship as a significant explanatory variable with a 95% confidence level. However, it pushed out alcohol consumption into the insignificant area. The coefficient for the scholarship variable showed that students that have a scholarship will have 0.19 GPA points higher than those who do not have a scholarship. It can be stated that having a scholarship is a strong driver for academic performance because usually scholarships have a minimum required GPA in order to be able to maintain that kind of financial aid. Overall, students would either feel pressured or motivated to have a required minimum GPA because this would mean that if they do not keep their GPA the sponsor of the scholarship (Bryant University for academic and athletic, and usually other outside sponsors for needs based) could potentially take it away. This would mean higher financial distress for the student or for his/her family. If a student fails to meet the requirements, sponsors put students in a probation status in which they have certain
amount of time to be able to bring their GPA back up (usually a semester). It is compelling to see that scholarships have a strong and positive effect on students’ academic performance.

**CONCLUSION**

The three different regression models showed that the most significant variables that are able to explain academic performance as measured by GPA are the total hours of study per class per week, high school GPA, amount of alcohol consumed per week, if students listen to music while they study, and if students have a scholarship. In average, the three models are able to describe about 23% of the variations in GPA relative to the variations in the explanatory variables. This means that the three models have a relatively weak predictive power.

This Honors Thesis, however, provides insight into the factors that are most significant derived from the sample of Bryant University students. It is clear that these factors can help students to determine some steps they could take in order to increase their GPA. For example, students could hold back on alcohol consumption per week so that their GPA is not negatively affected due to the harmful aspects that binge drinking can bring. Furthermore, students could restrain themselves from listening to music while they study because their overall GPA would be better off by 0.19 points. The results from the hours of study per class per week shed light into the fact that diminishing marginal returns to GPA exist. It is recommended that students study at the optimal level so that they are able to maximize their GPA. The results of the regression show that studying more time is not necessarily better.

The other two factors: high school GPA and scholarships are not factors that students could directly affect during their college experience (unless they are able to get a scholarship that pressures them into keeping a minimum GPA during those years). High school GPA is an explanatory variable that feeds into the results of college GPA because it also shows a student’s level of academic performance through their pre-undergraduate experience. Therefore, the results show that people with higher GPAs in high school tend to have higher levels of GPA in college because of their predetermined effort, time-management, and being able to fulfill their responsibilities in an academic environment.
In a survey of 664 professional recruiters, “over 80% of them reported using a minimum GPA cutoff in their decision-making” because college grade point averages are valid predictors of job performance (Kuncel et al. 64). This shows the importance of why students should pay attention to improving their college GPAs. Furthermore, “GPA is widely accepted as an indicator of academic success and is routinely used by organizations in decisions about who to interview, who to hire, and what level of compensation to offer” (Dunegan 239). The implications of this study show how the labor markets are constantly looking for students with the highest GPAs in order to select them to create more value to their entities. It is important to mention that even though GPA is widely accepted, the quality of students understanding is hard to measure. For example, some students could sign up for easier classes that will not put to the test their overall critical thinking skills and their academic understanding. This could actually be harmful for students and for the employer that hires them because their level of human capital might not be as high as shown in their GPA.

Jones and Jackson mentioned in their study that “using GPA to allocate expenditures on student aid would yield a higher social return because of the formation of increased human capital by persons with higher grade” (254); therefore, this connects the fact that scholarships would generate higher returns not only for students but for positive outcomes in the labor markets. Also, higher grades would increase a first-entrant’s earnings regardless of the amount of money that a firm spends in the level of worker investment (Jones & Jackson 264). These conclusions help to strengthen the fact that GPA is regarded highly in the labor markets and understanding the factors that influence GPA are valuable to future employees and employers that want to generate greater value for their institution.
LIMITATIONS AND FUTURE STEPS

The main limitation found in this Honors Thesis is that only five of the seventeen variables were statistically significant. It would be more interesting to see higher significance levels from other important variables such as how parents’ level of education or income can actually affect a student’s GPA. An explanation for this limitation could be that the sample size is relatively small since only 136 responses were readily available to be analyzed. Therefore, a lot of variation in such a small sample size negatively affects the power of regression analysis. Greater number of responses could be achieved if a wider communication with professors in Bryant is developed. For example, investigators could approach professors that teach students from different years to include questionnaires in their classes (this would improve number of responses since students are asked to complete the questionnaire through a more authoritative figure than just a simple e-mail). Usually, students do not tend to answer questionnaires through e-mails (which was the main way of distributing it) since they can easily disregard it.

GPA is not the only way to measure success or the only thing that recruiters look at when trying to hire people to enter the labor force. Many factors come into play like leadership, work experience, and volunteer work. However, GPA is widely used because it is a quantifiable factor of a student’s performance during their college careers. Another important factor that was not included in this Honors Thesis was the SAT exam results because Bryant University students are not required to show these when applying to this college. “Although the SAT has been shown to be affected by human capital acquired through education, it is the best available measure for natural ability” (Oehrlein 61). Including this variable would have affected the sample size even more since it could have been skipped when answering the questionnaire.

Another important limitation that could affect how employers select employees could be university selectivity. It is shown that labor force recognition for people with higher GPAs has increased over the years. However, a study showed that “in the presence of career ladders, first jobs matter because they open doors; as a consequence, a medium-ability student who graduated from a selective college can have better career opportunities than a high-ability student who graduated from a less selective college” (Hershbein 30). This could have a strong
implication for less selective colleges just because students of other more recognized universities could have higher earnings and further job growth just because of college recognition. As mentioned in the introduction, Bryant University has an average admittance rate of 72.3%, which could be seen as a less selective school.

The future steps that could be taken in order to further the studies of the results found in this Honors Thesis would be to take larger number of samples from Bryant University students. The law of large numbers could be better applied to future analysis which would increase the predictive power of models. In the case of this Honors Thesis, the average predictive power as measured by the adjusted $R^2$ was 23%. This can be improved with a larger sample and even including other independent variables.

The results shown in this Honors Thesis should be shown to Bryant University students so that they could tweak their studying techniques and habits so that they can improve their GPAs. The statistically significant variables should be taken into special consideration in order for students to better understand the steps they can take to get ready to enter the labor market. The Bryant community could strongly benefit from having better job opportunities, higher salaries, and future job growth just by showing improved academic performance as measured by GPA.

Finally, deeper studies of the significant explanatory variables could shed more light of factors that affect GPA. For example, the effects of music specifically on academic performance. An interesting study could look at how different kinds of music (i.e. rock, classical, pop, rap, etc), could affect GPA while studying. Furthermore, a deeper insight of motivating/pressure factors like having a minimum required GPA to maintain a scholarship. All of these steps could be taken so that students are able to improve their academic performance to be able to fiercely compete in the labor force. Not only getting better benefits in general; but also having greater productivity which ultimately affects the economy in a positive manner.
APPENDICES

Appendix A – Descriptive Statistics

Figure 1.- Gender

Figure 2.- Athletes vs. Non-Athletes
Figure 3.- Students Pursuing a Double Major

![Double Major Chart]

- 33 Double Majors
- 103 Not Double Majors

Figure 4.- International vs. American Students

![International vs. American Students Chart]

- 71% American Students
- 29% International Students
Figure 5.- Percentage of Students in Bryant University’s Two Colleges

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Appendix B – Statistical Relationships and Regressions

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Academic Performance of Undergraduate Students in Bryant University
Honors Thesis for Emilio Avalos

Model 1.- Regression

Number of obs  =  136  
F(17, 118)    =  3.36  
Prob > F       =  0.0001  
R-squared     =  0.3261  
Adj R-squared =  0.2290  
Root MSE      =  0.3102

| gpa       | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|-----------|--------|-----------|-------|------|----------------------|
| totalstud*| -0.0144295 | 0.007863  | -1.84 | 0.069 | -0.0299993 to 0.0011403 |
| female    | -0.0120427 | 0.056531  | -0.21 | 0.832 | -0.1239897 to 0.0999042 |
| senior    | 0.0027344  | 0.114273  | 0.02  | 0.981 | -0.2239576 to 0.2290264 |
| junior    | -0.0871278 | 0.120813  | -0.72 | 0.472 | -0.3263698 to 0.1521141 |
| sophomore | -0.1431988 | 0.118013  | -1.21 | 0.228 | -0.3769705 to 0.0905728 |
| athlete   | -0.0765591 | 0.089654  | -0.86 | 0.391 | -0.2527335 to 0.0996152 |
| business  | -0.0673906 | 0.066     | -1.02 | 0.309 | -0.1980891 to 0.0633078 |
| scholarship| 0.1742886 | 0.091347  | 1.91  | 0.059 | -0.0066033 to 0.3571804 |
| workhrs   | 0.0007513  | 0.003815  | 0.2   | 0.844 | -0.006803 to 0.0083056 |
| sleephrs  | 0.0268403  | 0.026251  | 1.02  | 0.309 | -0.0251443 to 0.0788249 |
| parenteduc| -0.0049055 | 0.009332  | -0.53 | 0.6   | -0.0233851 to 0.0135741 |
| hsgpa ***  | 0.276628  | 0.083232  | 3.32  | 0.001 | 0.1118058 to 0.4414502 |
| music ***  | -0.1912639| 5.74E-02  | -3.33 | 0.001 | -3.05E-01 to -7.76E-02 |
| flozalc   | -0.0037386| 0.004004  | -0.93 | 0.352 | -0.0116666 to 0.0018493 |
| income    | -1.09E-08 | 1.06E-07  | -0.1  | 0.918 | -2.21E-07 to 1.99E-07 |
| doublemajor| -0.0402036| 0.06745   | -0.6  | 0.552 | -0.1737721 to 0.093365 |
| international| 0.0493962| 0.067044  | 0.74  | 0.463 | -0.0833688 to 0.1821613 |
| _cons     | 2.570959  | 0.382142  | 6.73  | 0     | 1.814214 to 3.327704 |

Model 2.- Regression

Number of obs  =  136  
F(4, 131)      =  10.65  
Prob > F       =  0.0000  
R-squared     =  0.2455  
Adj R-squared =  0.2224  
Root MSE      =  0.31151

| gpa       | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|-----------|--------|-----------|-------|------|----------------------|
| flozalc   | -0.00652 | 0.003788  | -1.72 | 0.088 | -0.01401 to 0.0009763 |
| totalstud | -0.02063 | 0.00751   | -2.75 | 0.007 | -0.0354894 to -0.005777 |
| hsgpa     | 0.305472 | 0.072815  | 4.2   | 0    | 0.1614261 to 0.4495185 |
| music     | -0.19879 | 0.055333  | -3.59 | 0    | -0.3082514 to -0.089329 |
| _cons     | 2.66764  | 0.269754  | 9.89  | 0    | 2.134003 to 3.201278 |
**Model 3. Regression**

| Variable | Coef.   | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|----------|---------|-----------|-------|-----|----------------------|
| gpa      | -0.00495| 0.003778  | -1.31 | 0.192| -0.0124254 0.0025237 |
| flozalc  | -0.01927| 0.0074    | -2.6  | 0.01 | -0.0339049 -0.004626 |
| totalstud| -0.274965| 0.072659  | 3.78  | 0    | 0.131218 0.4187118  |
| hsgpa    | 0.18585 | 0.054626  | -3.4  | 0.001| -0.2939263 -0.077783 |
| music    | 0.197792| 0.082582  | 2.4   | 0.018| 0.0344126 0.3611712  |
| _cons    | 2.578371| 0.267614  | 9.63  | 0    | 2.048929 3.107812   |
REFERENCES


Read, Jennifer P.; Jennifer E. Merrill, Christopher W. Kahler, David R. Strong, Predicting functional outcomes among college drinkers: Reliability and predictive validity of the Young Adult Alcohol Consequences Questionnaire, Addictive Behaviors, Volume 32, Issue 11, 2007, Pages 2597-2610.


