Big Fish in Bigger Ponds: The Effect of High School Academic Self-Concept on College Mental Health

Deepak Venkatasubramanian Paige Masten

The University of North Carolina, Chapel Hill

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Abstract

This paper studies the effect of high school academic competitiveness on college mental health through the lenses of academic self-concept and the "Big Fish Little Pond" theory. We compile a dataset containing survey information from first-year students at UNC Chapel Hill along with information on the academic characteristics of their high school to analyze the effect of their performance relative to their high school's performance on the ACT on their mental health outcomes in college. We find that students from the middle quintile of high schools who outperform their school have a lower probability of having depression. While insignificant, we find that high performing students from the bottom quintile of high schools have a higher probability of having both anxiety and depression. Our study, inconclusive, can offer insights to those interested in investigating the determinants of adolescent mental health along with stakeholders at universities who wish to optimize mental health resource allocation.

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Introduction

Mental health is one of the most important issues facing higher education today. Mental illness, particularly depression and anxiety, is becoming increasingly prevalent on college campuses — according to a 2018-19 Healthy Minds study, results indicate that 36% of students are categorized as having some level of depression and 31% report elevated levels of generalized anxiety (Eisenberg & Ketchen Lipson, 2019). When left untreated, students' symptoms only worsen, and can significantly hinder their academic success. Four of the top five obstacles to academic success, as reported by students, are sleep difficulties, stress, anxiety, and depression (Douce & Keeling, 2014). As a result, students with poor mental health typically experience lower GPAs and higher dropout rates than their peers. UNC is no exception to this growing crisis. An April 2019 report from the University's Mental Health Task Force found that 37% of UNC's undergraduates reported feeling so depressed it was difficult to function, while 60% felt a sense of overwhelming anxiety. Between the 2012-13 and 2016-17 academic years, the number of triage appointments at Counseling and Psychological Services increased by 104% (UNC-Chapel Hill Mental Health Task Force, 2019).

This paper seeks to explain the link between the high school experience and the mental health challenges encountered by college students in their first year. Specifically, this paper explores the role of high school academic competitiveness in determining the mental health outcomes of first-year students. This question has not been addressed in the literature thus far. Though the existing literature has explored academic and social stressors associated with the transition to college, there has not been a significant investigation of a link between high school academic competitiveness and perceived mental health in first-year college students.

The paper is organized as follows. Section 1 reviews academic literature to detail the theoretical mechanisms that contribute to academic self-concept and mental illness development. Section 2 describes the acquisitions and modifications of our data sets. Section 3 presents our theoretical model. Section 4 presents our estimates for our model and our interpretation of these results. Section 5 concludes the paper.

I] Background

Peer Effects and the "Big Fish Little Pond" effect

First year college students undergo a precarious period of personal development as they transition into an environment that allows them to explore their academic pursuits, career aspirations, sexual relationships and other freedoms associated with their foray into adulthood. A prominent mechanism shaping this development is a series of exogenous forces that manifest themselves in a student's environment. Peer effects can refer to "any externality in which peers' backgrounds, current behavior, or outcomes affect an outcome" (Sacerdote, 2011, p.2). This general definition has allowed numerous economists to attribute the role of peer effects in shaping various facets of a student's life. Numerous studies exhibit the overarching role of peers in influencing student behavior, ranging from their propensity to consume alcohol (Kremer & Levy, 2008) to their academic performance in the presence of distracting peers (Lazear, 2001). With specific regards to education, peer effects have been widely credited in affecting the academic performance, decisions and perceptions of students. Particularly, the academic performance of a student has been linked to the abilities of their peers. A study conducted by Hoxby and Weingarth finds that students at the pole ends of the performance distribution benefit most from the addition of similarly-performing students (Hoxby & Weingarth, 2000). These

results have been reinforced by the works of Burke & Sass (2008) as well as Imberman et al. (2009).

In order to procure insights about a student's mental health, however, a focus on their ability and performance might not suffice — one must also consider a student's self-perception of their academic ability. Bong & Skaalvik (2003) define this idea of academic self-concept as "one's knowledge and perception of one's own academic ability." The notion of self-concept with relation to peer effects is best epitomized by the "Big Fish Little Pond Effect," a phenomenon first studied by Marsh & Parker (1984). By studying schools composed of students from varying socio-economic statuses (SES), they concluded that students from lower SES/ability schools indicated a higher academic self-concept than similarly performing students from high SES/ability schools. This negative effect was further expounded by Marsh and Hau, who studied this effect in students from 26 countries to demonstrate its cross-cultural generalizability (Marsh & Hau, 2003).

In order to isolate the effects of academic competitiveness on a student's educational attainment, we must consider a student's academic self-concept with regards to the relative academic standings of their peers. This is best captured by the study of ordinal rank on a student's educational attainment (Elsner & Isphording, 2017). Studies have found that students of a lower ordinal rank to their peers tended to underinvest in human capital. This was shown to have a significant impact on their likelihood to complete their education at a four-year university — a student ranking just 10 places below another was estimated to be 1% less likely to complete their college education. Elsner & Isphording suggest various reasons for the association between lower ordinal rank and lower academic performance. It is most important to note that students with a higher ordinal rank had a higher perception of their academic ability. The study suggests

that students may "infer their absolute ability from their relative ability in their cohort," thereby incorrectly informing a student of their gains from education (p. 819).

When examining this phenomenon from the lens of transitioning from high school to college, we hypothesize that a student's relative academic standing in high school will have a role in shaping their academic self-concept, particularly for students on the pole ends of the high school performance distribution. For example, a high-ability student from a lower achieving school may perceive a disparity between their ordinal rank in high school as opposed to their standing in college as opposed to a similarly performing student from a higher performing school. The conscious acknowledgement of this disparity can profoundly affect a student's mental state; qualitatively, "grades and competition" has been the most frequently reported stressor reported by students in prior studies (Lee et al., 2005). Our study seeks to investigate and quantify these potential effects, a question that has not been explored in the literature thus far. That is, how does becoming a big fish in a bigger pond affect a student's self-concept and overall mental health?

Stress Proliferation and the Stress Process Model

Stress — and, by proxy, the stress process — is a complex and variable phenomenon. Aneshensel (1992) iterates that stress is "not an inherent attribute of external conditions, but emanates from discrepancies between those conditions and characteristics of the individual — his or her needs, values, perceptions, resources, and skills." The stress process paradigm, as we understand it, has three conceptual components: stressors, moderators/mediators, and mental health outcomes. An important distinction to consider is that the stress process is, by its very nature, a process, and thus evolves over time within the context of people's lives. Wheaton (1994) presents the idea of a "stress universe," which suggests that nearly every major context in

which people are engaged is a potential source of stressors — including (but not limited to) their academic endeavors. Pearlin et al. (1997) introduce the idea of stress proliferation as a pivotal aspect of the stress process. Stress proliferation is the "expansion or emergence of stressors within and beyond a situation whose stressfulness was originally more circumscribed" (Pearlin et al., 1997). New, secondary stressors may emerge from primary stressors, thus leading to a configuration, or accumulation, of stressors that introduce an added layer of difficulty to people's lives. For example, Pearlin et al. (1981) found that job disruption can yield additional hardships, such as marital conflict and economic strain.

Another key observation regarding the stress process is that it is profoundly influenced by people's placement in social and economic statuses. According to Pearlin et al. (1997), the occurrence and extent of proliferation depends on both the social and economic characteristics of those facing the hardship and on the possession of resources they can draw. That is, differences in the mental health outcomes of stressors can be explained by what collectively can be referred to as resources — and, importantly, resources most certainly vary with individuals' social and economic status. Resources — namely coping, social support, and mastery — function as both mediators and moderators in the stress process. Pearlin & Bierman (2013) hold that mediators trace the effects of stressors on mental health, while moderators influence the impact of the stressor on the outcome.

An important moderator in the stress process that stands out as especially relevant for this study is individuals' sense of self-concept, also referred to as mastery. Mastery in this context refers to "the extent to which one regards one's life-chances as being under one's own control" (Pearlin & Schooler, 1978). A sense of personal control may help to neutralize the threat(s) posed by stressors. Individuals equipped with high levels of resources may be able to pool them

in the course of experiencing stress (Pearlin & Bierman, 2013). Like other aspects of the stress process, however, mastery is inversely related to indicators of socioeconomic status (Schieman et al., 2003), and therefore may lead to discrepancies in the mental health outcomes of individuals from different social strata. Students experience physical and psychological impairment when stress is perceived negatively or becomes excessive (Murphy & Archer, 1996). Mental health outcomes of the stress process are most typically elements of distress, such as anxiety, anger, and depression. Pearlin & Bierlin (2013) write that these indicators "have proven to be sensitive and reliable barometers of the socially rooted stressors people encounter as they enact their various social roles and engage in their various relationships."

Studies by Adlaf et al. (2001), among others, have found that rates of elevated psychological distress are significantly higher among college students than among the general population. The prevalence of stress and poor mental health among college students is particularly troubling, as it is strongly correlated with concerns related to educational achievements, substance use and abuse, violence, and reproductive and sexual health (Patel et al., 2007). Although the existing literature contains numerous studies of stress among college students and its relation to coping behaviors and overall health, it has yet to explore the relationship between high school academic competitiveness, self-concept and mental health outcomes of college students. Such a study will enhance our collective understanding of psychological distress among the college population, and better inform university stakeholders of the mechanisms guiding student mental health and assist them in more insightful decision-making.

II] Data and Methods

This study involves the use of two sources of data regarding each facet of the project: a student's mental health and the characteristics of their high school. To address the mental health of individual students, we use a dataset titled "Transitions: A Study of College Life and Well-being," compiled by Dr. Jane Fruehwirth, an Economics professor at UNC-Chapel Hill. In the Fall of 2019, along with Dr. Krista Perriera and a team of undergraduate students, Dr. Fruehwirth conducted a survey to collect information on the determinants of anxiety and depression in first-year students at UNC. The survey was conducted in two waves — the first wave in October 2019, where 295 students were interviewed, and the second in January and February of 2020, where 829 students were interviewed. The survey aims to measure a student's reported perception of their mental health, presence of psychological resources, social support and college stressors. The dataset also contains a wealth of information on an individual student's demographic and socio-economic status such as their race, parental education, sexual and gender identity and their performance on high school standardized exams. To assess a student's level of self-reported anxiety and depression, we are using two well-accepted questionnaire scales — namely the Patient Health Questionnaire (PHQ-8), to measure depression levels, and the Generalized Anxiety Disorder Assessment (GAD-7). These questionnaires, a component of the survey, allow us to quantify a student's reported level of anxiety of depression and we can use these valid scales to distinguish between minimal and severe levels of anxiety and depression (Mossman et al., 2017). Using this dataset allows us to capture a holistic and detailed picture of the student in order to examine the factors that contribute to their mental health.

To assess students' high school experiences, we used data from the North Carolina School Report Cards (SRC), which is made publicly available each year by the North Carolina

Department of Public Instruction. The SRC data is provided for all district, charter, and alternative schools operating during the school year, and consists of data in a number of areas concerning student performance and academic growth, as well as school and student characteristics. These indicators are reported at the school, district, and state level. For this study, we chose to narrow our focus to three specific indicators: the school's federal Title I status, 2017-18 ACT scores and 2017-18 ACT Benchmark achievement. North Carolina administers the ACT, a standardized test to measure college readiness, to all 11th grade students during the March statewide administration. The NCDPI ACT data has results for the four subtests that make up the composite score (English, Reading, Math and Science) and the Writing subtest; for each school, we included the mean score for the individual subtests, as well as the percent of students at that school who met the benchmark for each one. The Title I program — the largest federal aid program for public schools in the United States — provides funding to states and districts to improve education for economically disadvantaged students. Eligibility for the program is based on the percentage of students who qualify for free and reduced-price lunch. The achievement gap between high- and low-income students has been well-documented (Bailey & Dynarski, 2011; Belley & Lochner, 2007), and a 2018 analysis from the United States Government Accountability Office found that public high schools with more students in poverty provide "fewer academic offerings to prepare for college" (Nowicki, 2018).

We can combine these datasets by linking the name of the high school provided by the student to a school's unique agency code provided by NCDPI. We were able to compile the information of a student's mental health with the academic characteristics of their high schools, allowing us to investigate the connection between the academic competitiveness of one's high

school and their self-reported mental health in college. Our final dataset contained 591 student observations with 11 variables of interest used in our analysis.

TABLE I

Moderate to Severe Anxiety or Depression (N=599)				
	No(%)	**Yes(%)**	**Total(%)**	**P>Chi.Sq**
High School Mean ACT				0.245
Bottom quintile	18.97	17.68	18.61	
2nd quintile	19.2	24.39	20.64	
Middle quintile	18.97	23.17	20.14	
4th quintile	19.44	18.29	19.12	
Top quintile	23.42	16.46	21.49	
Title 1				0.511
No	95.78	96.95	96.11	
Yes	4.22	3.05	3.89	
Race				0.003
White alone	63.47	64.63	63.79	
Black alone	7.26	7.32	7.28	
Asian/PI alone	14.52	9.15	13.03	
Hispanic	10.54	6.71	9.48	
Other	4.22	12.2	6.43	
Highest Parental Education				0.943
Less than high school	3.04	4.27	3.38	
High school or GED	4.92	5.49	5.08	
Associate's degree	4.22	3.66	4.06	
Some college, no degr	8.43	6.71	7.95	
Bachelor's degree	33.26	32.32	32.99	

Beyond Bachelor's degree	46.14	47.56	46.53	
Gender				0.015
Woman	62.3	71.95	64.97	
Man	34.89	23.17	31.64	
Other	2.81	4.88	3.38	
	Mean	**Std. Dev**		
High School Mean ACT	20.44	2.88		
Student ACT Score	29.75	3.69		
Score differential	9.31	3.64		
N	**427**	**164**	**591**	

Table I contains the summary statistics of our dataset highlighting the prevalence of either anxiety or depression in our sample, Pearson's Chi-Square statistics for each variable along with the mean and standard deviation of our variables. Table II lists the results of our logistic regression in the terms of the marginal effects of our covariates in predicting a student having either depression or anxiety. Considering our low sample size of 591, we choose to interpret the significance at the 90% confidence level.

In our sample of 591 students, 164 students reported having either anxiety or depression. We divided our schools into 5 categories by the quintile distribution of their mean ACT score. With an even number of students in each category, it does not appear that there is a significant difference between the reported mental health of students in each category nor a significant effect played by Title 1 status on having either anxiety or depression. While over 60% of our sample were white individuals, our test statistics report that there is a significant difference in the reported mental health levels between the various races in our sample. It appears the majority of

our sample have a parent with either a bachelor's degree or more, with a relatively small population who have a high school degree or less. Women comprise about 65% of our sample, while there is a small portion of students who do not identify within the gender binary. Considering UNC's status as a prestigious public school in North Carolina and the country, it was expected that the mean ACT scores for our sample are higher than the mean of the high school average ACT scores. This is also highlighted by the score differential that on average, the students in our sample outperform their high school's average ACT score by 9.31 points. If we look at the distribution of how these students perform relative to their schools by each category of high school, we see a higher portion of students from the bottom 20% of ACT scores outperforming their school by remarkable numbers (Table III). With this we can infer the presence of some "big fish" in their "little ponds" and use our regression estimates to study the impact of their college transition on their mental health.

III] Model

In order to gather insights into the role played by the academic rigor of a student's high school on their college mental health outcome, we construct a model to predict a student's mental health outcomes using the characteristics of their high school and the student's individual performance relative to their high school. To highlight the effect played by the disparity between the academic orientation of the student and the quality of their school, we interact the performance of a student's high school (based on quintiles of their mean ACT score) with the difference between the school mean score and the student's ACT score (score differential). A high proportion of students with ACT scores that exceed their school's average score, would allow us to identify the "big fishes" and the "little ponds." In addition to these measures of

academic rigor, we also estimate the impact played by the school's status as a Title 1 school and include controls on the student's race, gender identity.

$$M_{i,j} = \alpha + \beta_1 HS_j + \beta_2(ACT_i - \underline{ACT_j}) + \beta_3(HS_j)(ACT_i - \underline{ACT_j}) + \beta_4 T_j + X_i\delta + \varepsilon_i$$

$M_{i,j}$= Mental health outcome of student 'i' at high school 'j'

HS_j = Category of high school (based on quintiles of ACT score)

$\underline{ACT_j}$= Composite Mean Score of high school 'j'

ACT_i= ACT Score of student 'i'

T_j= Title 1 status

X_i= Demographic and socio-economic characteristics of student 'i'

Our conceptual model hopes to predict mental health outcomes based on the pathways channeled by performance on the high school ACT exam in relation to their high school mean, the academic rigor of their high school while controlling for a student's individual characteristics.

IV] Results

TABLE II

	Marginal Effects on Probability of Depression			Marginal Effects on Probability of Anxiety		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Differential	0.0047 (.0067)	.	-.0013 (.0054)	.0109* (.0065)	.	-.0001 (.0052)
ACT Score	-.0040 (.0071)	.0011 (.0056)	.	-.0108 (.0068)	.0010 (.0052)	.
HS Category						
Bottom	.	.0106 (.0561)	-0.0343 (0.0564)		-0.017 (0.0545)	-0.0326 (0.0568)
2nd	.	.0081 (.0534)	-0.0226 (0.0545)		-0.022 (0.0508)	-0.0451 (0.052)
Middle	.	*ref*	*ref*		*ref*	*ref*
4th	.	-0.0070 (.0534)	-0.0252 (0.0571)		-0.0322 (0.0517)	-0.0441 (0.0553)

Top	.	-.0435 (.0518)	-0.0822 (0.0551)		-0.0903* (0.0482)	-0.1194** (0.0519)
HS Category X Differential						
Bottom	.	.	.0142 (.0089)	.	.	.0027 (.0098)
2nd	.	.	.0095 (.0111)	.	.	.0146 (.0102)
Middle	.	.	.0256** (.0122)	.	.	-.0166 (.0126)
4th	.	.	.0043 (.0122)	.	.	.0043 (.0120)
Top	.	.	.0094 (.0089)	.	.	-.0062 (.0078)
N	591	591	591	591	591	591

Standard errors in parentheses
** p<.1, ** p<.05, *** p<.01*
The marginal effects were calculated using a post-estimation command after a logistic regression. The average marginal effects of the interaction is interpreted as the marginal effect on depression or anxiety by a one unit increase in the differential by the high school category. Additional controls were included to account for race, highest parental education, the Title 1 status of the school and the student's gender identity.

As seen in Table II, we construct 6 models that capture the average marginal effects of various academic components on a student's probability of having anxiety or depression. Model 1 finds no significant effects of a student's ACT score or their relative ACT performance on their propensity of having either depression or anxiety. Model 4, however, concludes that the score differential has a significantly positive effect on the probability of having anxiety. Model 2 and 5 introduces the category of high school into our model. From their results, we cannot report significant effects played by HS category and a student's individual ACT score when controlled in tandem. These models, while relatively inconclusive, allow us to consider the potential mechanisms of an individual's performance and the quality of their high school.

Model 3 interacts the academic rigor of the high school with the relative performance of the student. This allows us to capture any differences in how a well-performing student's mental health may differ depending on the quality of high school they came from along with their relative academic standing in high school and can provide insights into the applicability of the "Big Fish little Pond" theory. We calculate this using the average marginal effect of the difference of scores on predicting mental health outcomes with respect to the category of high school. Significant positive results would indicate that a 1-unit increase in the ACT score differential would have a positive effect on the probability of having either anxiety or depression. With regards to the probability that a student has depression, we see that only students from the middle quintile of the school distribution would witness a significant impact played by their relative performance in high school on their probability of having depression. We can infer that for students from a high school in the middle quintile, a 1-point increase in the score differential would decrease their probability of having depression in college by 2.56%. While we see a similar pattern of marginal effects in the development of anxiety (see Table V), we do not observe a significant effect of the score differential on predicting the probability of having anxiety with respect to the academic standing of the high school as seen in Model 6. Though insignificant, we can see the largest positive effects of the score differential on the development of mental illness development arises from the lowest quintile while the largest negative effect arises from the middle quintile. We can observe these patterns in a plot of our marginal effects in Table IV. This is generally in line with our hypothesis that students who relatively outperform their schools in low performing schools may see a paradigm shift in college, contributing to a higher probability of depression. As discussed, this may proliferate from stress and feelings of inadequacy brought on by the interaction of their high academic self-concept with their new

relative standing in college. We do not expect these developments from students in the middle and high quantiles who may not observe a large disparity in their academic self-concept and their relative standing in college and therefore may not develop these stressors and feelings of inadequacy.

V] Conclusion

The importance of mental health cannot be understated in our society today. It is by no means a simple subject. The acquisition and treatment of mental health along with the accompanying conversations surrounding the de-stigmatization of mental illness is an ongoing but necessary discussion. The increasing prevalence of mental illnesses such as anxiety and depression among college students motivates the need to investigate the channels that drive this trend. More specifically, we believed the presence of mechanisms that could affect the mental health of students during the transition from high school to college. Using a sample of first-year students at UNC-Chapel Hill, we investigated the effect of a student's relative position in high school and the quality of their high school on their mental health in college. While our results were inconclusive, we were still able to discern a pattern from our study on the interaction between the ACT score differential and the academic performance of a high school. We observed that higher performing students from the bottom quintiles of high schools had a higher propensity to develop depression in college. A similar, insignificant trend was also observed for the prevalence of anxiety. With more waves of surveys conducted along with more students surveyed from various schools, we believe that more insightful results can be procured with a greater sample size and variation among students. With colleges and universities placing a greater importance in mental health treatment, we believe that our framework can be used by interested stakeholders in understanding the mental illness proliferation in first-year students.

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Appendix

TABLE III

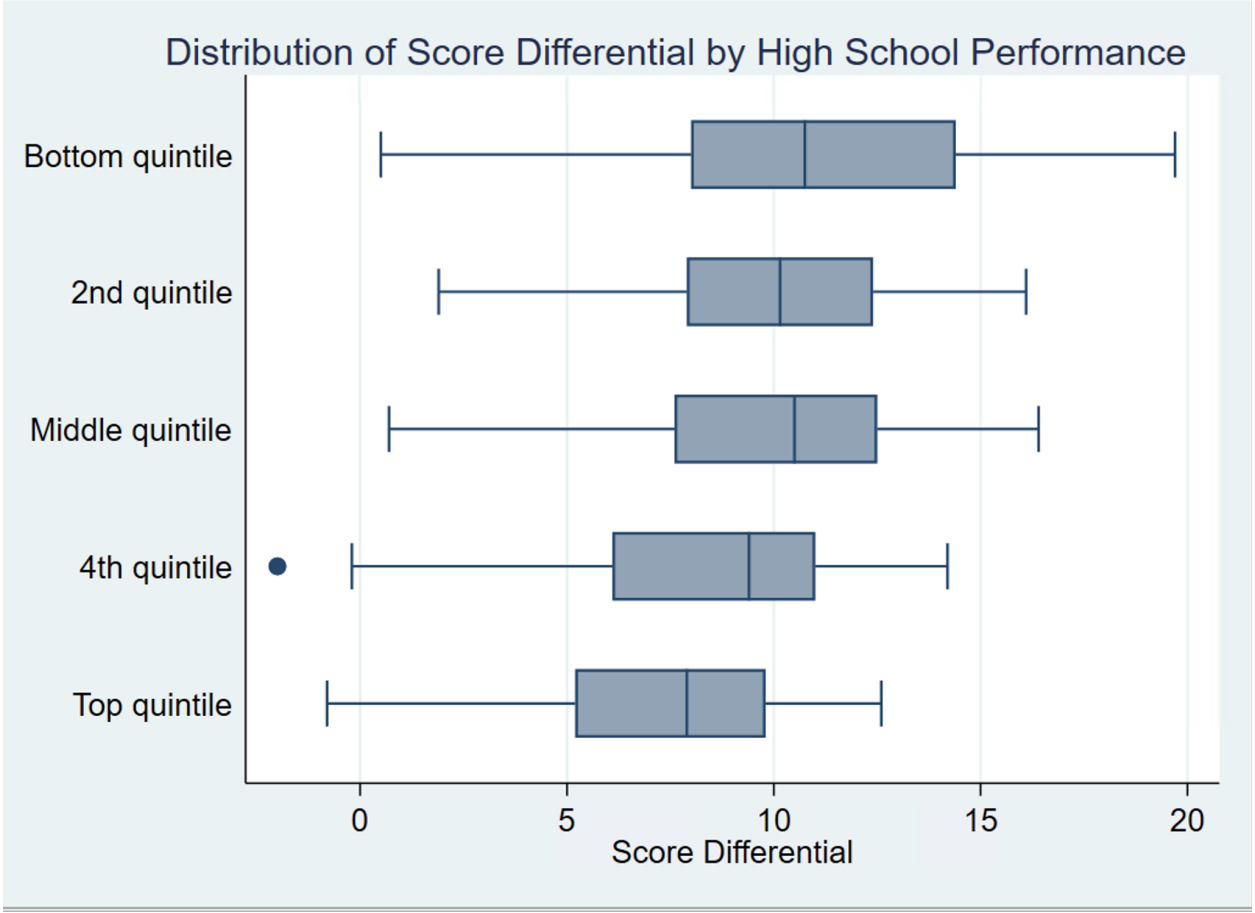


TABLE IV

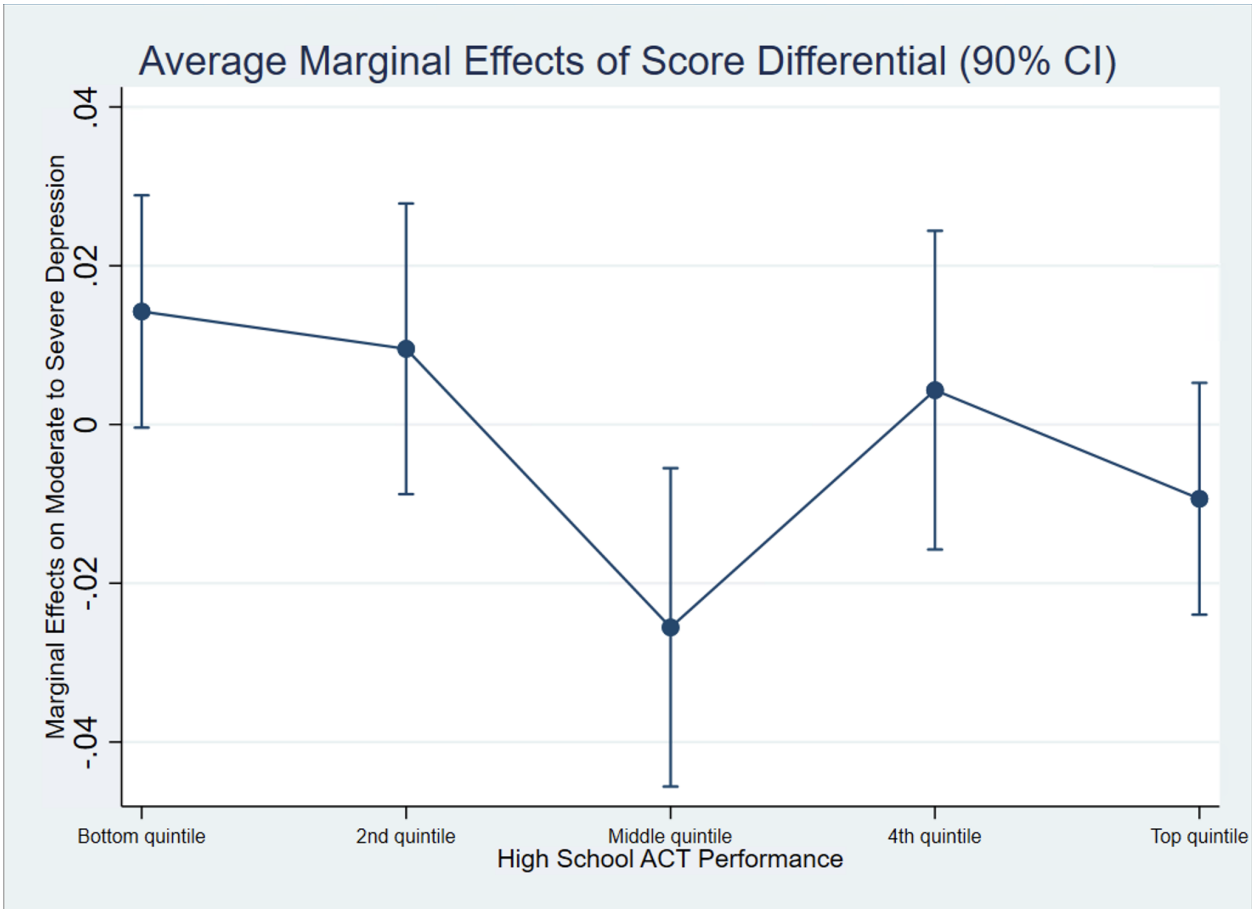
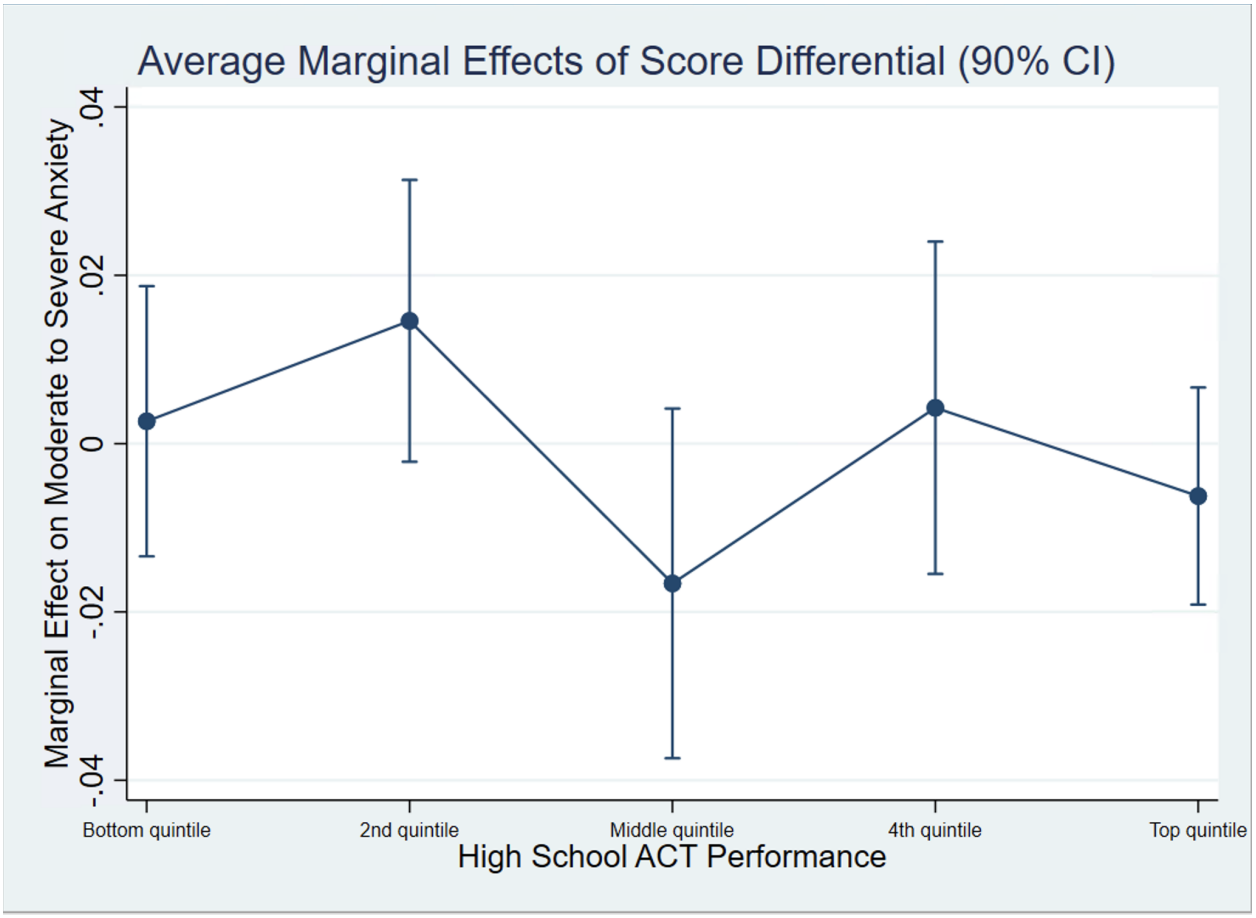

Average Marginal Effects of Score Differential (90% CI)
Marginal Effects on Moderate to Severe Depression
.04
.02
0
-.02
-.04
Bottom quintile
2nd quintile
Middle quintile
4th quintile
Top quintile
High School ACT Performance

TABLE V


Average Marginal Effects of Score Differential (90% CI)
Marginal Effect on Moderate to Severe Anxiety
.04
.02
0
-.02
-.04
Bottom quintile
2nd quintile
Middle quintile
4th quintile
Top quintile
High School ACT Performance