Success in High School Economics and Performance in College

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Preliminary Research – Please Do Not Quote or Cite without the authors' permission

Abstract:

The focus of our research is to determine if a link exists between success in high school economics classroom and performance in college. And, if that link exists, measure its magnitude. Our research relies on the extensive student level data kept by the Georgia Department of Education that has been merged with data from the University System of Georgia. The outcome of interest is each student's performance in their first year of college as measured by their overall freshman GPA (FGPA). The explanatory variable of interest is ECON_EOCT, which represents the scale score each student received on the mandated Economics End of Course Test they took in high school. The theory is that students develop valuable analytical skills in high school economics that will translate into greater success in college. We find that learning economics in high school does improve overall performance in the first year of college (a critical year for most students). The results have profound implications for those states that are considering a mandatory economics course as part of their high school curriculum.

"The theory of economics does not furnish a body of settled conclusions, immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking which helps its possessor draw correct conclusions."

John Maynard Keynes

Introduction and Background:

Education plays a critical role in preparing our youth to become productive citizens. Which skills, however, best prepare future workers, consumers, and fully engaged citizens are hotly debated. What should make up a standard curriculum particularly in a time where Federal funding to states is linked to measures of student success is in flux. For years economic educators have pushed for more exposure to economic concepts in the k-12 curriculum based on the idea that students need the knowledge, skills, and experiences provided by economic content in order to navigate the increasingly complex financial world around them. In addition, the habits of mind that are perhaps formed by economics may develop analytical and other skills that are valuable outside the financial realm.

But, few have studied the importance of the economic way of thinking as it helps students succeed in building human capital. Economics may help students develop skill that will make them better learners in a general sense. We examine one measure of the development of human capital: the impact of learning economics in high school on college freshman year grade point averages (GPA).

We choose to examine high school economics in part from professional curiosity but also because we believe the analytical thinking skills inherent in economics may provide an advantage to developing minds. Furthermore, the state of Georgia requires all high school students to take (and pass) a standardized end of course test in economics in order to graduate. We have access to student-level test scores in the economics test. We also have access to student administrative data for those students who continued on to a public college or university in Georgia. Therefore, we can control for student ability outside of the economics

course and analyze the hypothesis that success in the high school economics course translates to an advantage in college course taking.

The link between a college education and labor market success is well documented. However, the role that college GPA plays as a measure of the accumulation of human capital is unclear. Some suggest it plays a signaling role that is only loosely connected to actual human capital. Others suggest that it does, in fact, offer a discernible indicator of skills. Among the latter group, a number of researchers have examined the importance of college success as measured in GPA in determining future labor market outcomes. For example, Wise (1975) in an early attempt to demonstrate the importance of college grades as an indicator of worker productivity (as opposed to simply a screening tool for employers) concludes that one must reject the hypothesis that no such link between college grades and future success exists. Furthermore, he finds significant roles of college selectivity as an indicator of future labor productivity and, hence value to employers. Filer (1983), examined male/female wage differentials, and suggests not only that educational attainment as measured by GPA is an important determinant of labor market outcomes but also reduces the impact of labor market discrimination. Jones and Jackson (1990) find evidence confirming previous studies that employers use college GPA is an indicator of the human capital gained in college rather than using it simply as a screening device to sort job applicants. Therefore, if one accepts that a higher college GPA represents more human capital accumulation than a lower college GPA, *ceteris paribus*, it is reasonable to conclude that any treatment that improves college performance will translate to better subsequent labor market outcomes.

What, then, helps prepare students for college? What habits of the mind adequately prepare a person for his or her future? George Stigler, 1982 Nobel Laureate, set a high bar for economics if it is to displace other disciplines in high schools (1970). He argued first that few teachers at the high school level are prepared to teach the economic thought process and, instead, tend to focus on the geometry of price determination and the rote memorization of institutional facts. It is precisely the economic way of thinking, he suggests, that adds value. If Stigler's conjecture is correct, then success in a high school economics may not produce a

material increase in human capital that would translate to later success in other areas—like freshman grade point averages.

Most of the work that examines the impact of high school economics course work on success in college examines the impact of high school economics on success in college economics coursework. Becker, Greene and, Rosen (1990) in a summary of the past research findings concerning high school economics indicate that high school students can learn economics – that is the skills required are not prohibitively advanced for their age group. The implication being two-fold: First, high school students are not too young. And, second, there should be some advantage to introducing students to the discipline. Saunders (1970) found evidence that high school economics course work does provide some assistance in preparing students for college economics courses but no so much that the college professors can assume the students are ready for advanced material. Other economists, however, such as Lopus and Maxwell (1994) question whether or not high school economics even prepares students for college level economic courses at all. They find significant variation in the level of quality of high school economics classes in confirmation of Stigler's worst fears.

No study to our knowledge, however, examines the broader question as to whether students are better prepared for college work in general having learned high school economics? Our interest lies in one aspect of the link between high school education and college success: the role high school economics can play in creating a foundation for later achievement. It is possible that the skills required of economic thinking, for example, analytical thinking, abstract logic, and the ability to use data, contribute to the overall likelihood of future achievement. Even if these skills can be transmitted to high school students in a good economics course, and if these skills helped students achieve more in other subjects, the question remains as to whether high school economics courses do translate in success in college.

Georgia is one of 22 states that require high school students to take an economic course. It is one of 19 states that requires students to be tested in their mastery of economic knowledge before graduation. It is the only state that requires a high-stakes End of Course Test (EOCT) upon completion of the economics course. While economics classes differ across the

state, the state Department of Education requires that every class cover five basis domain areas (each one tested on the EOCT): (1) Fundamentals of Economics, (2) Microeconomic Concepts, (3) Macroeconomic Concepts, (4) International Economics, and (5) Personal Finance Economics. The EOCT itself is a 90 question multiple choice standardized test of economic knowledge.[1]

While the isolation of one discipline in the high school curriculum may be difficult, we believe unique aspects of our data set allow us to isolate many factors that would otherwise confound our ability to conclude anything about one particular course. For starters, because all high school students in Georgia are required to take an economics class, selection into a high school economics class is not a concern. Second, we know student's SAT/ACT scores and overall high school GPAs, therefore we have measures of general intelligence and achievement that have been shown to be indicators of college preparedness. Finally, we observe students who matriculate at a wide range of institutions within Georgia. Therefore, we can examine a broad range of measures of subsequent success.

Model

We endeavor to test the null hypothesis that student performance on a standardized high school end of course test (required for all students in Georgia) does not significantly contribute to the explanation of student performance (as measured by freshman year GPA) in college. The hurdle we face in rejecting the null hypothesis is sufficiently isolating the effect of the high school economics EOCT performance as a contributing factor of college performance.

We construct a standard education production function in order to model a student's grade point average (GPA) in his or her first year in college. The model can be broken down into different sources of influence on the student's GPA. First, we focus on student demographic characteristics. Past research has shown that student demographic information is relevant to modeling learning outcomes. Therefore, we model the influence of gender with a dummy variable that takes on a value of 1 for female and 0 for male. We have a series of

[1] Of the 90 questions, 75 count toward the student's score. Each test also field tests 15 questions which do not count toward the student's score.

indicator variable for ethnicity (black, Hispanic, Asian, other non-white) with white as the omitted category. We have a dummy variable that takes on the value of 1 if the student is categorized as disabled (with no specification of the type of disability). We know if a student received a free or reduced-price lunch in high school. This serves as an indication of a student facing an economic challenge. We also know if the student was of limited English proficiency and what year the student graduated from high school.

Our direct measures of student human capital that may influence freshman year college GPA include the student's SAT score (or ACT score converted to its SAT equivalent score), the student's high school GPA, and the student's score on the economics EOCT.

Because high school characteristics may be important determinants of later success in college, a third component of the model includes high school factors. We know the student/teacher ratio for each school. We know the percent of teachers with graduate degrees for each school. We know the average years of experience for teachers of each school. We also know the ethnic makeup of each school, the proportion of the student body that receives free or reduced price lunches, and the proportion of the student body of each school that is categorized as disabled. Finally, we employ a fixed effects model to control for unobserved but systematic differences between high schools and the colleges and universities where the students matriculate. This second set of shift parameters is consistent with Wise's (1975) observation that the selectivity of the college or university where a student attends affects student labor force outcomes. Therefore, the basic model we construct takes the form:

$$FGPA_i = \alpha + \beta_j \sum_{j=1}^{9} DC_{i,j} + \gamma_k \sum_{k=1}^{3} HC_{i,k} + \delta_m \sum_{m=1}^{9} SC_{s,m} + \mu_s + \varphi_c + \varepsilon_i. \qquad [1]$$

$FGPA_i$ represents an individual student's freshman year college GPA. $DC_{i,j}$ represents the vector of eight student demographic characteristics available in the data. $HC_{i,k}$ represents a vector of three student human capital variables. $SC_{s,m}$ represents a vector of nine school level characteristics, and μ_s represents the set of high school-level fixed effects parameter and δ_c represents the set of college and university fixed effects parameters. Finally, ε_i is a student level error term assumed to be i.i.d.

Data

We use data from 2006 to 2008 on all Georgia high school students who immediately upon graduation matriculated to a two- or four-year University System of Georgia (USG) institution to address this question. We obtained student-level data on student characteristics (race, income-status, etc.) and student outcomes in high school (SAT/ACT score, high school GPA, and scale score on the Economics End of Course Test) for students who graduated from public high schools in Georgia in 2006, 2007, and 2008. These data were provided by the Georgia Department of Education (GaDOE). For the 2006-2008 graduates who matriculated to a University System of Georgia (USG) institution immediately after high school, we also have information on their success in their first year of college, including their GPA in their freshman year of college. These data were provided by the USG. We also merged school-level characteristics of each public high school into these student level data. We obtained mean student characteristics and mean teacher characteristics for each high school from the Governor's Office of Student Achievement (GOSA) and the GaDOE, respectively. We have complete and unique observations for 68,702 students over the time period of the study. Summary statistics of the data appear in Table 1.

The data are unique for a number of reasons. First, we have extensive student information. The student level characteristics allow us to control for variables that are often linked to success in both high school and college. The characteristics of individual high schools allow us to control for those factors that are unique to each school. The fact that we have SAT (or ACT converted) scores allow us to capture the general level of student highs school achievement. But, unique to our data, are the facts that we have a standardized measure of specific achievement in a high school economics class and freshman year GPAs for a wide variety of colleges and universities across the state. At the time of our study, the USG governed 34 colleges and universities across the state that ranged from very selective institutions such at Georgia Tech and the University of Georgia to non-selective two-year institutions. The USG has almost 300,000 students at that time.

Results

In Table 2, we report our results obtained from estimating equation (1) via OLS. The first column contains our estimation results without Economics EOCT scores included in the model. We include the Economics EOCT scores in the regression results presented in column 2. The results presented in column 2 are our primary results; column 1 is presented for comparison purposes.

The estimated effects of student demographic characteristics and achievement in high school on success in college tell a familiar story. Males, African Americans, students from economically disadvantaged backgrounds (as measured by eligibility for free or reduced price lunches), and students classified as disabled have lower first year GPAs (FGPAs) in college relative to other students. Students with higher ACT/SAT scores and students who earned higher GPAs in high school also performed significantly better academically during their first year of college. Each of these effects is statistically significant. The school level characteristics included in the model are generally not statistically significant with the exceptions of average teacher experience and percent of student population of Asian descent.

Our results also indicate that, when controlling for a very broad spectrum of other factors related to educational outcomes, students who perform better on the Economics End of Course Test will earn higher GPA's during their freshman year of college. The effect is statistically significant at the 1% level. This finding indicates that students with a stronger understanding of economics are likely to perform better in college than their classmates who have less economics knowledge after controlling for the other traditional determinants of college success including high school GPA and SAT/ACT score. The expected increase in freshman GPA should also translate into a higher likelihood of HOPE retention (HOPE is a Georgia specific scholarship program that awards students who maintain a 3.0 or above grade point average in college a partial or whole tuition scholarship). Therefore, at least in Georgia, freshman year success increases the likelihood that students can continue their undergraduate education.

Table 3 contains the marginal effects of a number of variables derived from the results presented in the second column of Table 2. The marginal effects are calculated as the effect of

a 1 standard deviation increase for continuous variables and the effect of having a value of 1 for dummy variables as opposed to a value of 0. The magnitude of the marginal effect of a one standard deviation increase in a student's economics knowledge (again, as measured by increases in the standardized Economics EOCT) on his/her college freshman GPA is approximately half the size of the marginal effect of being economically disadvantaged (as measured by free or reduced price lunch eligibility in high school) and very similar to the effect of a one standard deviation increase in SAT/ACT score. This is suggestive of the importance of economics being part of the standard high school curriculum if college preparedness is a goal.

Discussion

Our results indicate that the better a student performs in a high school economics class the better prepared that student is for college. This effect is in addition to the typical indicators of college readiness. We believe that the reason for this added effect is that as a discipline economics requires students to think in abstract ways that combine mathematical and special logic with symbolic representation of real-world phenomena. These skills are subtly different from the skills tested in a general test such as the SATs. Our findings bolster the argument that economics should be part of the typical high school curriculum. We go beyond the traditional reasoning – already a strong argument – that students need to be familiar with the economic world around them so that they can be better workers, consumers, and citizens. Our results suggest that students also become better learners if they master the skills required in a high school economics course and that those skills will help them do well in college. While, admittedly, this is a first brush examination of the link between high school economics coursework in Georgia and general success in college, it opens up a new avenue for investigation into the critical role economic education should be playing in our schools.

Tables:

Table 1: Summary Statistics	
	Mean
	(Std. Dev.)
SAT Score/100	10.374
(or ACT converted)	(1.713)
Economics EOCT Score/100	5.890
	(1.090)
High School GPA	3.190
	(0.515)
Freshman GPA	2.602
	(0.969)
Female	0.569
	(0.495)
Black	0.258
	(0.438)
Asian	0.047
	(0.213)
Hispanic	0.025
	(0.155)
Other Race	0.017
(White Omitted)	(0.129)
Economically Disadvantaged	0.184
	(0.388)
Disabled	0.018
	(0.134)
Limited English Proficient	0.003
	(0.056)
Graduation Class	2007.1
	(0.810)
Student Teacher Ratio	17.6
	(2.0)
Pct Teachers w/ Advanced Degree	0.617
	(0.070)
Average Teacher Experience	12.4
	(2.2)
Pct School Economically Disadvantaged	34.2
	(20.6)
Pct School Disabled	10.2
	(2.8)
Pct School Asian	3.777
	(5.285)

Pct School Other Race	2.027
	(1.239)
Pct School Black	33.1
	(26.8)
Pct School Hispanic	6.201
	(7.075)
Sample Size (# of Students)	68,702

Table 2: Effect of Having Economics in High School on College Freshman GPA		
	Without Econ EOCT	With Econ EOCT
SAT Score/100	0.0402***	0.0329***
(or ACT converted)	(0.0029)	(0.0030)
Economics EOCT Score/100	--	0.0408***
	--	(0.0044)
High School GPA	1.0507***	1.044***
	(0.0083)	(0.008)
Female	0.106***	0.111***
	(0.006)	(0.006)
Black	-0.075***	-0.073***
	(0.010)	(0.010)
Asian	0.021	0.024
	(0.015)	(0.015)
Hispanic	0.010	0.010
	(0.020)	(0.020)
Other Race	-0.107***	-0.108***
(White Omitted)	(0.023)	(0.023)
Economically Disadvantaged	-0.087***	-0.087***
	(0.009)	(0.009)
Disabled	-0.070***	-0.070***
	(0.023)	(0.022)
Limited English Proficient	0.054	0.056
	(0.054)	(0.054)
Graduation Class	-0.008	0.027***
	(0.006)	(0.007)
Student Teacher Ratio	-0.001	-0.001
	(0.004)	(0.004)
Pct Teachers w/ Advanced Degree	0.009	0.031
	(0.120)	(0.120)
Average Teacher Experience	0.011*	0.009
	(0.006)	(0.006)
Pct School Economically Disadvantaged	0.002	0.0017
	(0.002)	(0.0017)
Pct School Disabled	-0.0026	-0.001
	(0.0045)	(0.005)
Pct School Asian	0.013*	0.016**
	(0.007)	(0.007)
Pct School Other Race	0.009	0.014
	(0.009)	(0.009)
Pct School Black	0.000	0.001

	(0.002)	(0.002)
Pct School Hispanic	0.012**	0.011**
	(0.005)	(0.005)
College Fixed Effects	Yes	Yes
High School Fixed Effects	Yes	Yes
R-squared	0.356	0.357
Sample Size (# of Students)	68,702	68,702

*** Indicates statistical significance at the 1% level. ** Indicates statistical significance at the 5% level. * Indicates statistical significance at the 10% level.

Table 3: Marginal Impact of Performance on High School Economics EOCT

Table 3: Marginal Effects	
Economics EOCT Score	0.044
SAT Score	0.056
High School GPA	0.537
Female	0.111
Black	-0.073
Asian	0.024
Hispanic	0.010
Other Race	-0.108
(White Omitted)	
Economically Disadvantaged	-0.087
Disabled	-0.070
Limited English Proficient	0.056

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