

**The Link Between Advanced Placement Experience  
and College Success**

Kristin Klopfenstein  
Associate Professor of Economics  
Texas Christian University  
TCU Box 298510  
Fort Worth, TX 76129  
(817) 257-6231  
k.klopfenstein@tcu.edu

M. Kathleen Thomas  
Assistant Professor of Economics  
Mississippi State University  
Box 9580  
326 McCool Hall  
Mississippi State, MS 39762  
(662) 325-2561  
kthomas@cobilan.msstate.edu

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## 1. Introduction

A recent survey of universities shows that the most important factor considered in admissions decisions is “high school GPA [grade point average] or class rank” (Breland, et al 2002). High schools commonly weight grades earned in AP courses, which are courses designed to replicate a college level curriculum, more heavily than those earned in other high school classes when calculating student GPA. While some universities re-calculate student GPA from student transcripts in order to standardize the various weighting practices across high schools, class rank is determined solely by GPA as calculated by the high school. Class rank is particularly important in Texas, Florida, and California because these states grant students in the top percentiles of their graduating high school class automatic admission to the state university system.<sup>1</sup>

Weighting AP grades is a theoretically sound practice because, assuming the correct weight is chosen, doing so neutralizes the risk of earning a lower grade in an AP course than in a less difficult high school level course. Without weights, the incentive exists for students to enroll in the easiest courses available to ensure that their GPA is not adversely affected by the lower grade that may be earned in difficult class. Thus their spot in the GPA distribution is preserved. Conversely, in high schools where AP grades are weighted, it is often statistically impossible to get into the top percentiles of the class rank without taking AP courses.

This paper seeks to gain evidence on whether AP grade weighting is justified from the college admissions standpoint. More explicitly, we test to see if the AP experience that so frequently puts students at the top of their classes transfers to better performance in college. We do not separate students based on AP exam grades for the analysis because, practically speaking,

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<sup>1</sup> Each of these states has slightly different policies. Texas is the only state with completely open enrollment to any university for all students in the top 10 percent of each high school’s graduating class. This practice results in an inordinate number of students in remedial courses at the state’s most selective four-year institutions.

high schools cannot limit grade weighting to students earning passing AP exam scores. The exams are taken in May, students graduate in June, and exam scores are not available until late summer. Consequently, high schools grant higher weight to all students who complete AP courses regardless of their exam performance.<sup>2</sup>

We find that a high school curriculum characterized by rigorous non-AP math and science courses improves the likelihood of early college success, but that AP experience confers few additional benefits. AP classes in science and economics have a significant positive impact on college persistence, but the most popular AP subjects, math, English, and history, do not. With the lone exception of Hispanic students taking AP science, AP experience has no impact on first semester college GPA. These results indicate that AP courses do no better than other challenging high school courses at preparing the average AP student for the academic demands of college.

## **2. The AP Arms Race**

The importance of class rank in college admissions combined with grade weighting has led to an AP arms race.<sup>3</sup> The AP arms race is an example of the classic Prisoner's Dilemma.<sup>4</sup> Consider two high school students with equal GPAs in the fall of their senior year, each vying for the position of valedictorian at a high school that weights AP courses. Suppose further that each student would ideally enroll in three AP courses, an ambitious but reasonable schedule for high ability, college-bound students. Perhaps each student could intellectually handle more AP courses, but in order to do well in more than three they would need to cease extra curricular activities, be under an undesirable amount of stress, and give up time with family and friends.

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<sup>2</sup> The College Board makes no claims about the competence of AP students who do not take the AP exams and has no policy regarding course weighting.

<sup>3</sup> The arms race analogy comes from a speech by former University of California President X (Geiser and Santelices 2004).

<sup>4</sup> Kreps (1990) provides a nice discussion of the Prisoner's Dilemma.

Perhaps one of the students can not handle the additional course and all course work suffers as a result.

One Nash Equilibrium occurs if the two students collude and agree to enroll in three classes.<sup>5</sup> Then, assuming each does well, the two will be tied for valedictorian. In this situation, there is a strong incentive to cheat: each student knows that if they enroll in just one more AP course, they will earn enough grade points to pass the other in class rank and become sole valedictorian. However, each knows that the other also has the incentive to cheat and therefore takes a risk of being pushed out of the co-valedictorian position by *not* cheating. Hence, a second Nash Equilibrium occurs when both students cheat, both take more AP classes than they ideally wanted to, and they remain co-valedictorian.

Now expand this example to the top ten percent of high school graduates that Texas automatically admits to state universities. With so many players in the high school vying for positions in the top ten percent of the grade distribution, collusion becomes impossible. Hence, the second Nash equilibrium, where all players take more AP classes than they ideally would, becomes inevitable.

Grade-weighting is widespread in practice, but the weights chosen vary tremendously. A survey of Texas public high schools conducted by one of the authors indicates that 98 percent of AP-offering high schools engaged in the practice, and there are two dominant weighting schemes. One system adds one point on a four-point scale, yields a 25 percent weight, and makes an A in an AP class worth five points while an A in a non-AP class is worth four points. The other adds ten points on a 100-point scale yielding a 10 percent weight. This system makes an A in an AP class worth 110 points while an A in a non-AP class is worth 100 points.

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<sup>5</sup> A Nash Equilibrium occurs when both students are satisfied with their own decision given the decision of the other student.

The pressure on high schools to expand their AP course offerings is immense. In 2005, high schools can choose from any of the 35 courses available from the College Board. Students want AP courses in order to develop impressive transcripts for selective colleges, and parents want them to make schools look better in order to keep real estate values high. In what can become a vicious cycle, faculty are stretched to limit teaching advanced courses where their own understanding of the material is just one step ahead of their students, and students are stretched to the limit taking “too many” (in the sense described above in the Prisoner’s Dilemma) AP courses. It time to consider whether the average student is benefiting from this environment in a concrete way.

### **3. Data and Theory**

We estimate the effect of AP course experience on early success in college using the Texas Schools Microdata Panel (TSMP). Our sample consists of over 28,000 Texas high school graduates who attend 31 four-year Texas public universities in the fall of 1999. We measure early college success in terms of persistence to the second year and first semester GPA. We define students as failing to persist if they do not enroll at a four-year institution in the fall of 2000 because they withdraw from higher education completely or transfer to a two-year institution. Students who undertake horizontal transfers from one four-year institution to another are considered to persist.<sup>6</sup>

Persistence to the second year is a more suitable indicator of the impact of AP experience than college graduation. The AP curriculum replicates freshman-level college courses, so any

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<sup>6</sup> Due to data limitations, we incorrectly identify students as failing to persist if they transfer to a private Texas four-year college or to a four-year institution outside of Texas. The frequency of misidentification is likely to be small. National statistics indicate that 82 percent of horizontal transfers originating from public four-year institutions enter another public institution. Moreover, horizontal transfers from four-year institutions occur, on average, 15 months after a student enrolls at the first institution (McCormick and Carroll 1997). Thus, most horizontal transfers to out-of-state or private universities have not yet occurred when we examine students 12 months after they first begin college.

preparatory benefits student derive from the program should be apparent within the first year of college. Furthermore, most withdrawals occur during, or immediately following, the freshman year (Tinto 1998, Tinto 1993, Pascarella and Terenzini 1980), and as Braunstein, McGrath, and Pescatrice (2000) find, “academic performance was the overwhelmingly most significant factor affecting a freshman’s decision to continue into the sophomore year” (191). If the high school AP experience enhances college academic performance, AP-takers should be more likely than otherwise similar non-AP takers to persist to the second year.

Table 1 presents an array of student, family and high school characteristics that are potentially important determinants of early college success, and Table 2 provides descriptive statistics for the variables we use to measure these characteristics in our models. Potentially important student characteristics include sex, ability, whether the student is enrolled full time at the university, and the rigor of the student’s high school course of study.

While there is no theoretical reason for sex to impact first semester college GPA, it might influence persistence since male high school graduates forego greater earnings opportunities by attending college than do females. Consequently, males are less likely to attend college at all and are more likely to drop out of college in the first year to pursue employment. The descriptive statistics provided in Table 2 reflect current gender trends.

High ability students are likely to have higher first semester grades and greater persistence rates than are lower ability students. We capture student ability and motivation through a combination of SAT scores, class rank, and high school GPA. Part-time status, equal to one if a student enrolls in less than twelve credit hours, is included to help control for educational commitment that might be compromised by work or family obligations (Tinto 1993).

A rigorous high school curriculum has been shown to be an important determinant of college success (Rose and Betts 2001, Adelman 1999). A “rigorous curriculum” is generally defined as one that provides students with a solid background in math and science and teaches students to read for comprehension and write clearly. While AP courses are one potential source of rigorous study, years of science studied, highest level of math achieved, and participation in honors courses also indicate the extent to which a student is academically prepared for college. Since colleges often consider years of foreign language study during the admissions process, we also include this variable in our models.

For the purposes of this study, we group AP courses into seven categories: math, including calculus and statistics; science, including biology, physics, and chemistry; English, including English language or English literature; economics, including microeconomics and macroeconomics; government, including U.S. government or comparative government; history, including U.S. history and European history; and psychology. While this is not an exhaustive list of available AP courses, it includes those courses commonly considered to provide the best preparation for the academic rigors of college.

Family traits also have a strong influence on early college success. Parents significantly influence their children’s decision to pursue a college education, and growing up in a household with college educated parents facilitates integration into a college environment (Hossler, Schmit and Vesper 1999; Somers, Cofer and Vander Putten 2002). Students from high income families achieve greater levels of educational attainment than those from low income families. High costs of attending college restrict the options of low-income students (McPherson and Shapiro 1997), and we expect higher family incomes to be associated with both higher probabilities of persistence and higher GPAs. Since low income students are most likely to work during school,

the omission of employment information, which is unavailable in the TSMP, may bias the estimated coefficient on family income. The omission of employment information will only be problematic for the conclusions of this study if the bias caused by the omission differs for AP and non-AP students, and there is no theoretical reason to think this would be the case.

The best measure of family income available in the TSMP is that reported on the Free Application for Federal Student Aid (FAFSA). However, income reported on the FAFSA can underrepresent a family's ability to pay for college because it does not include the value of home equity or the income of a non-custodial parent in cases of divorce. When students have access to these alternative forms of financial support, they often accept federal grants, which need not be repaid, but do not accept Stafford loans, which must be repaid after graduation. Therefore, we include a dummy variable for acceptance of a Stafford Loan to further control for family income.

High school quality varies widely, and it is important to account for this fact when considering which students are likely to succeed in college (Betts and Morell 1999). Ideally, we would control for variations in high school quality with school fixed effects, but the number of high schools in the sample is too large to allow for this approach. Instead, we identify specific high school characteristics that previous research has linked to school quality, such as the percentage of students who are low income, the percentage of teachers who have less than five years of teaching experience, and the number of AP courses offered. We assume participation in college entrance exams is a reasonable signal of students' intent to pursue higher education, and we include the percentage of students taking the SAT or ACT to capture peer influence on academic effort (Sacerdote 2000).

Regardless of overall school quality, one-on-one interaction between students and an adult mentor can help motivate and prepare students for college. Mentors are particularly

important for providing information and guidance about college when a student's parents are unable to do so (Klopfenstein, 2005). The most effective mentoring occurs when an authority figure, such as a teacher or counselor, maintains contact with an individual student over several years. This is most likely to occur in small schools and in schools with a low student/teacher ratio. We also include a dummy variable for high schools located in a rural area.

Finally, while a student's college performance depends largely on the skills and background they bring with them, their success is also dependent on the college environment in which they are learning (Tinto 1993). To capture the influence of universities on student success, we include fixed effects for the 31 universities in the sample.<sup>7</sup>

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<sup>7</sup> While there are Hispanic students in attendance at all 31 universities, there are white students in attendance at 30 schools and black students at 26 schools.

#### 4. Empirical Results

The appropriate modeling technique for persistence, which is a dichotomous variable equal to one if a student returns for a second year, is different from that for GPA, which is a continuous variable between zero and four. We model persistence using a logit model and GPA using ordinary least squares (OLS).<sup>8</sup> In a logit model, the marginal effect of each independent variable depends on the values of all the other variables. Therefore, the raw logit coefficients must be transformed based on a simulated “typical” student to determine the magnitude of the effect of AP experience on college persistence.<sup>9</sup> Table 3 presents the marginal effect of each independent variable on the likelihood of persistence for typical white, black, and Hispanic students.<sup>10</sup>

In Table 3, differences in predicted probabilities by race are generated solely by differences in mean characteristics; the coefficient estimates for white, black, and Hispanic students are statistically indistinguishable in the retention model.<sup>11</sup> Arbitrarily, Table 3 simulates typical male students who graduated from average non-rural high schools in Texas. A similar table for females can be constructed with comparable results.

The typical white, black, and Hispanic students are quite different. The typical white student has taken more than three years of high school science, more than two years of a foreign language, honors English, math through pre-calculus, and no AP classes. His parents have a college degree and he attends Texas A&M University, the most popular university among white

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<sup>8</sup> Although GPA is restricted to between zero and four, it is commonly modeled using OLS (see Betts and Morell (1999) and Stinebrickner and Stinebrickner (2003)).

<sup>9</sup> The predicted probability of persisting to the second year for observation  $i$  is  $\exp(\hat{\beta}' X_i) / (1 + \exp(\hat{\beta}' X_i))$ . Marginal effects are calculated based on changes in the predicted probability when dichotomous variables change from zero to one or when a continuous variable increases from one-half of a standard deviation below the mean to one-half of a standard deviation above the mean.

<sup>10</sup> Raw logit estimates are available from the authors upon request.

<sup>11</sup> In addition, coefficient estimates for students with family income below the median are statistically indistinguishable from those with family income greater than or equal to the median.

Texas high school graduates. The typical black student has taken exactly three years of science, two years of a foreign language, math through Algebra II, and no AP classes. His parents have a high school diploma and he attends Prairie View A&M University, an historically black university. The typical Hispanic student has taken more than three years of science, two years of a foreign language (often Spanish, in which he may be a native speaker), honors English, math through pre-calculus, and no AP classes. His parents have a high school diploma and he attends The University of Texas at El Paso, a border school that attracts a large percentage of Hispanic students.

Table 4 presents OLS coefficient estimates for the model explaining first semester college GPA. This time, coefficients are estimated separately for white, black, and Hispanic students because statistical tests show differential curriculum effects by race. The explanatory power of the model is quite high for cross sectional studies of this type ( $R^2$  is approximately 0.20 for all three samples).

The results from the two models of college success presented in Tables 3 and 4 are qualitatively similar.<sup>12</sup> The results are generally of the expected sign, statistically significant, and support existing research by Adelman (1999) and Rose and Betts (2001) demonstrating that students possessing strong backgrounds in math, science, and English fare better in college. However, after controlling for the balance of a student's high school curriculum, AP courses provide little or no additional post-secondary benefit.

Of the seven categories of AP courses studied, only AP science and AP economics significantly increase the likelihood that a student will persist to the second year. With a single exception, none of the seven categories of AP courses improve first semester college GPA; the

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<sup>12</sup> The consistency of the persistence results with the theory and with the GPA results is reassuring given the potential for misidentification of horizontal transfer students discussed in note 1.

exception, AP science, provides a significant boost in GPA for Hispanic students only. These results indicate that the three most popular categories of AP classes, math, English, and history, do not significantly improve college retention or GPA. While students passing the AP exams in these subjects may benefit financially by earning credit from the university, on average they are no better prepared for the academic rigors of college than their non-AP-taking counterparts.

AP math, which theoretically includes both calculus and statistics classes but in reality is heavily dominated by calculus classes, has a statistically insignificant impact on both retention and GPA. On the surface, this result appears to contradict the finding that rigorous math prepares students for success in college. However, calculus (with or without an AP designation) is included among the math curriculum variables and therein has the expected positive and large impact on both retention and GPA. The inclusion of the AP math dummy captures the additional effect of converting a non-AP calculus class into an AP calculus class; the insignificance of the variable reveals that converting to an AP class confers no additional benefit in terms of college preparation.<sup>13</sup>

Converting a standard calculus class into an AP calculus class at a particular high school may not provide a marginal benefit to AP students if the same teacher teaches both the AP and non-AP sections. The quality of teaching is presumably the same in both sections, but the quantity of material the teacher attempts to cover is much higher in the AP section. As noted in section two, the National Research Council (2002) states that the inclusion of too much content may actually prevent students from achieving “a deep understanding of the content and unifying concepts of a discipline.” The empirical findings presented here support the National Research

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<sup>13</sup>Sample sizes are large enough to facilitate the division of calculus into non-AP and AP sections. In the white sample, 18 percent of students took AP calculus, 12 percent took non-AP calculus, and the two groups are essentially mutually exclusive. In the black sample, nine percent of students took AP calculus and six percent took non-AP calculus; in the Hispanic sample, 13 percent took AP calculus while 11 percent took non-AP calculus.

Council findings that calculus best prepares students for the rigors of college when teachers are not pressured to sacrifice depth for breadth.

The insignificant effect of AP courses in our models is unlikely to be driven by collinearity. Since the average AP student takes courses in just two of the seven AP subjects, the correlations between AP subjects are low. The correlation coefficient between AP math and AP science is 0.33 in the white, black, and Hispanic samples. The most highly correlated AP categories, AP government and AP economics, result in a correlation coefficient of 0.68 in white and Hispanic samples and 0.65 in black sample, yet AP economics is significant in the retention model. The correlation coefficients between AP and honors classes are also low. The most highly correlated honors course and AP subject, AP and honors English, is approximately 0.40. Given the large sample sizes, these correlations are not strong enough by themselves to cause insignificance in the AP variables.

Although the absence of high pair wise correlations between the AP and other included variables does not eliminate the possibility of collinearity involving more than two variables, the robustness of the AP results is further supported by the general math and science curriculum variables. These variables, which have been shown to be statistically significant in other studies, reveal themselves to be equally significant here. Moreover, the AP course coefficients do not change in sign or significance when the honors variables are jointly removed from the model.

## **5. Conclusions**

It is critical to remember that AP courses do not provide a *college preparatory* curriculum; rather, they provide a *college level* curriculum. Moreover, the incentives associated with grade weighting are completely different than those associated with any other aspect of the AP Program. Weighting high school GPA for all AP students who earn high school credit is *not*

the same thing as giving college credit for passing AP exam scores once students enter the university. The College Board continually demonstrates that students earning passing scores on the AP exams have a similar, if not better, understanding of the material than comparable college students, and this study does *not* provide evidence regarding the preparedness of AP exam passers for college.

The results presented here indicate that among AP students as a whole, the average student is not benefited by the college level curriculum provided in AP courses any more than by a rigorous college-preparatory curriculum. This result should not be surprising given that AP courses require high school students to do the same work with which many college freshmen struggle. The current combination of high school grade weighting and the admissions emphasis on class rank clearly provide the incentive for students to enroll in more AP classes than they ideally would. Consequently, high schools should carefully consider the distortionary effects of giving extraordinary weight to AP courses. Most importantly, curbing the AP arms race requires common sense and good judgment from students and parents.

## References

- Adelman, C. (1999). *Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, D.C.: U.S. Department of Education Office of Educational Research and Improvement.
- Betts, J. and Morell, D. (1999). The determinants of undergraduate GPA: The relative importance of family background, high school resources, and peer group effects. *Journal of Human Resources*, 34(2): 268-93.
- Braunstein, A., McGrath, M., and Pescatrice, D. (2000). Measuring the impact of financial factors on college persistence. *Journal of College Student Retention*, 2(3): 191-2003.
- Breland, H., J. Maxey, R. Gernand, T. Cumming, C. Trapani. (2002). *Trends in College Admission*. <http://airweb.org/trends.html>. Retrieved June 29, 2005.
- College Board (2003). AP fact sheet. Retrieved August 29, 2004. from [http://apcentral.collegeboard.com/repository/ap03\\_factsheet\\_0803\\_27295.pdf](http://apcentral.collegeboard.com/repository/ap03_factsheet_0803_27295.pdf).
- College Board (n.d.a). *Teachers and schools*. Retrieved July 15, 2003, from <http://apcentral.collegeboard.com/teachers/0,3060,153-0-0-0,00.html>.
- College Board (n.d.b). *Participation in AP: Annual Participation*. Retrieved December 12, 2003, from <http://apcentral.collegeboard.com/article/0,3045,150-156-0-2055,00.html>.
- Geiser, S. and Santelices, V. (2004). *The Role of Advanced Placement and Honors Courses in College Admissions*. Retrieved April 1, 2005, from <http://repositories.cdlib.org/cshe/CSHE-4-04/>.
- Hossler, D., Schmit, J., and Vesper, N. (1999). *Going to college: How social, economic, and educational factors influence the decisions students make*. Baltimore and London: Johns Hopkins University Press.

- Klopfenstein, K. (2005). Beyond test scores: The impact of black teacher role models on rigorous math-taking. *Contemporary Economic Policy*, 23(3): 1-13.
- Klopfenstein, K. Klopfenstein, K. (2004a). The Advanced Placement Expansion of the 1990s: How Did Traditionally Underserved Students Fare? *Education Policy Analysis Archives*, 12(68). <http://epaa.asu.edu/epaa/v12n68/>.
- Klopfenstein, K. (2004b). Advanced Placement: Do minorities have equal opportunity? *Economics of Education Review*, 23:115-131.
- Klopfenstein, K. (2003). Recommendations for Maintaining the Quality of Advanced Placement Programs. *American Secondary Education*, 32(1): 39-48.
- Kreps, D.M. (1990). *A Course in Microeconomic Theory*. Princeton, NJ: Princeton University Press.
- McCormick, A.C., and Carroll, C.D. (1997). Transfer behavior among beginning postsecondary students: 1989-94. National Center for Education Statistics Report 97-266. Retrieved 09/16/04 from [www.nces.ed.gov/pubs97/97266.pdf](http://www.nces.ed.gov/pubs97/97266.pdf).
- McPherson, Michael S. and Morton O. Schapiro. (September 1997). Financing Undergraduate Education: Designing National Policies. *National Tax Journal*. (50)3. pp. 557-71.
- Mellor, L., Dougherty, C., Hsieh, Y., and Jian, S. (2004). *Impact of Increasing Participation and Success in Advanced Placement (AP) Programs*. National Center for Educational Accountability Research Report 3.
- Morgan, R. and B. Maneckshana (2000). AP students in college: An investigation of their course-taking patterns and college majors. (Statistical Report 2000-09). Princeton, NJ: Educational Testing Service. Retrieved 09/15/03 from [www.collegeboard.com/ap/pdf/validity2.pdf](http://www.collegeboard.com/ap/pdf/validity2.pdf).

- National Research Council (2002). Learning and understanding: Improving advanced study of mathematics and science in U.S. high schools. Center for Education, Division of Behavioral and Social Sciences and Education. Washington, D.C.: National Academy Press.
- Pascarella, E.T. and Terenzini, P.T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Education*, 51(1): 60-75.
- Rose, H. and Betts, J.R. (2001). *Math matters: The links between high school curriculum, college graduation, and earnings*. San Francisco, CA: Public Policy Institute of California.
- Sacerdote, B. (2001). Peer Effects with Random Assignments: Results for Dartmouth Roommates. *Quarterly Journal of Economics*, 116(2): 681-704.
- Somers, P., Cofer, J., and VanderPutten, J. (2002). The early bird goes to college: The link between early college aspirations and postsecondary matriculation. *Journal of College Student Development*, 43(1): 93-107.
- Stinebrickner, R. and Stinebrickner, T.R. (2003). Understanding educational outcomes of students from low-income families: Evidence from a liberal arts college with a full tuition subsidy program. *Journal of Human Resources*, 38(3):591-617.
- Tinto, V. (1998). Colleges as communities: Taking research on student persistence seriously. *Study of Higher Education*, 21(2): 167-77.
- Tinto, V. (1993). 2<sup>nd</sup> ed. *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.
- Willingham, W. and M. Morris (1986). Four years later: A longitudinal study of Advanced Placement students in college. (College Board Report No. 86-2; ETS RR No. 85-86).

Princeton, NJ: Educational Testing Service.

**Table 1**  
**Theoretical influences on college success**

influence	variable descriptions	expected effect
<i>Student characteristics</i>		
sex	=1 if female	?
ability and effort	SAT math score	+
	SAT verbal score	+
	=1 if graduated in top ten percent of class	+
	high school GPA	+
commitment to college	=1 if part-time student	-
years science (relative to <3 years)	=1 if 3 years of science	+
	=1 if >3 years of science	+
years foreign language (relative to <2 years)	=1 if 2 years of foreign language	+
	=1 if >2 years of foreign language	+
highest math taken (relative to algebra 1 or less)	=1 if geometry	+
	=1 if algebra 2	+
	=1 if trigonometry	+
	=1 if precalculus	+
	=1 if calculus	+
honors classes (relative to no honors)	=1 if honors English	+
	=1 if honors science	+
	=1 if honors social science	+
AP classes (relative to no AP)	=1 if AP calculus or statistics	+
	=1 if AP biology, physics, or chemistry	+
	=1 if AP English language or English literature	+
	=1 if AP microeconomics or macroeconomics	+
	=1 if AP U.S. government or comparative government	+
	=1 if AP U.S. history or European history	+
	=1 if AP psychology	+
<i>Family characteristics</i>		
family income	family income	+
	(family income) <sup>2</sup>	-
	=1 if student receives a Stafford loan	-
parent education (relative to some college)	=1 if college degree or more	+
	=1 if high school degree or less	-
<i>Peer/school characteristics</i>		
low income peers	percent students low income	-
college bound peers	percent students who take the SAT or ACT	+
AP availability	number of AP courses offered	+
inexperienced teachers	percent teachers <5 years experience	-
availability of mentoring	student/ teacher ratio	-
	school enrollment	-
	(school enrollment) <sup>2</sup>	+
rural school	=1 if school located in a rural area	?

**Table 2**  
**Descriptive Statistics**

Variable	White	Black	Hispanic
<i>Dependent Variables</i>			
First semester GPA (4.0 scale)	2.59 (1.02)	2.10 (1.01)	2.22 (1.08)
Persistence to second year	0.80	0.75	0.73
<i>Student characteristics</i>			
Female	0.54	0.63	0.57
SAT math (scaled 20-80)	54.70 (9.10)	43.60 (8.50)	48.10 (8.80)
SAT verbal (scaled 20-80)	53.70 (8.70)	44.00 (8.60)	47.00 (8.80)
Graduated in top ten percent	0.27	0.12	0.21
High school GPA (4.0 scale)	3.50 (0.71)	3.16 (0.66)	3.41 (0.64)
Part-time student	0.03	0.04	0.06
Science=3 years	0.39	0.44	0.38
Science>3 years	0.47	0.32	0.48
Foreign language=2 years	0.41	0.51	0.45
Foreign language>2 years	0.48	0.29	0.44
High math geometry	0.02	0.07	0.02
High math algebra 2	0.23	0.40	0.27
High math trigonometry	0.09	0.06	0.09
High math pre-calculus	0.38	0.30	0.36
High math calculus	0.29	0.14	0.25
Honors English	0.58	0.42	0.54
Honors science	0.49	0.30	0.44
Honors social science	0.46	0.31	0.41
AP math	0.19	0.09	0.14
AP science	0.15	0.10	0.13
AP English	0.29	0.18	0.25
AP economics	0.13	0.07	0.10
AP government	0.16	0.09	0.14
AP history	0.13	0.07	0.08
AP psychology	0.03	0.03	0.01
<i>Family characteristics</i>			
Family income	61,490 (28,386)	35,719 (25,526)	36,871 (25,669)
Stafford loan	0.21	0.50	0.33
Parent college	0.46	0.29	0.20
Parent high school	0.26	0.43	0.61

**Table 2, cont.**

	White	Black	Hispanic
<i>Peer/school characteristics</i>			
Percent peers low income	19.80 (14.70)	34.00 (18.20)	47.60 (25.20)
Percent peers SAT/ACT	72.10 (14.20)	64.90 (14.70)	63.30 (16.50)
Number AP courses offered	8.90 (6.80)	8.30 (6.40)	7.20 (5.60)
Percent teachers inexperienced	22.60 (7.10)	22.90 (7.00)	22.70 (7.40)
Student/teacher ratio	15.60 (2.40)	16.30 (2.30)	15.80 (2.20)
Enrollment	1879 (929)	1943 (943)	1932 (830)
Rural school	0.31	0.12	0.16
N	19801	3126	5240

Source: Texas Schools Microdata Panel

The means for dummy variables represent the proportion of the sample reporting a one. Standard deviations are reported in parentheses below the mean for continuous variables.

**Table 3****Marginal changes<sup>a</sup> in predicted probability of average freshman continuing to second year**

	White	Black	Hispanic
Baseline probability	87.2	76.8	74.1
Female	1.9 *** (2.2)	3.0 *** (3.9)	3.3 *** (4.5)
SAT verbal (scaled 20-80)	0.4 (0.5)	0.6 (0.8)	0.6 (0.8)
SAT math (scaled 20-80)	0 (0)	0 (0)	0 (0)
Graduated in top ten percent	4.2 *** (4.8)	7.0 *** (9.1)	7.7 *** (10.4)
High school GPA (4.0 scale)	4.5 *** (5.2)	4.7 *** (6.4)	7.1 *** (10.1)
Part-time student	-10.7 *** (-12.3)	-15.5 *** (-20.2)	-16.3 *** (-22.0)
Science<3 years	-2.4 *** (-2.8)	-3.6 *** (-4.7)	-4.0 *** (-5.4)
Science=3 years	-0.1 *** (-0.1)	-	-0.1 *** (-0.1)
Science>3 years	-	0.1 *** (0.1)	-
Foreign language<2 years	-1.2 (-1.4)	-0.5 (-0.7)	-0.5 (-0.7)
Foreign language=2 years	-0.9 (-1.0)	-	-
Foreign language>2 years	-	1.4 (1.8)	1.5 (2.0)
High math algebra 1 or less	-7.3 *** (-8.4)	-6.1 *** (-7.9)	-11.6 *** (-15.7)
High math geometry	-4.6 (-5.3)	-2.5 (-3.3)	-7.5 (-10.1)
High math algebra 2	-2.8 ** (-3.2)	-	-4.6 ** (-6.2)
High math trigonometry	-0.4 *** (-0.5)	3.3 *** (4.3)	-0.7 *** (-0.9)
High math pre-calculus	-	3.8 *** (4.9)	-
High math calculus	2.3 *** (2.6)	7.0 *** (9.1)	4.0 *** (5.4)
No honors classes	-1.6 *** (-1.8)	-	-2.7 *** (-3.6)
Honors English	-	2.3 *** (3.0)	-
Honors science	-1.5 *** (-1.7)	-2.5 *** (-3.3)	-2.6 *** (-3.5)

**Table 3, cont.**

	White	Black	Hispanic
Honors social science	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
AP math	-0.7 (-0.8)	-1.1 (-1.4)	-1.1 (-1.5)
AP science	1.2 ** (1.4)	2.0 ** (2.6)	2.1 ** (2.8)
AP English	0 (0)	-0.1 (-0.1)	-0.1 (-0.1)
AP economics	1.5 * (1.7)	2.5 * (3.3)	2.6 * (3.5)
AP government	0.8 (0.9)	1.3 (1.7)	1.5 (2.0)
AP history	0.2 (0.2)	0.3 (0.4)	0.3 (0.4)
AP psychology	1.6 (1.8)	2.7 (3.5)	2.9 (3.9)
Family income	0.9 *** (1.0)	1.7 *** (2.2)	1.8 *** (2.5)
Stafford loan	-1.2 *** (-1.4)	-1.9 *** (-2.5)	-2.0 *** (-2.7)
Parent college	-	3.5 *** (4.6)	3.8 *** (5.1)
Parent some college	-2.5 *** (-2.9)	-0.1 (-0.1)	-0.1 (-0.1)
Parent high school	-2.5 (-2.9)	-	-
Percent peers low income	-0.8 *** (-0.9)	-1.5 *** (-1.9)	-2.2 *** (-2.9)
Percent peers SAT/ACT	1.2 *** (1.4)	1.9 *** (2.5)	2.2 *** (3.0)
Number AP courses offered	0.2 (0.2)	0.3 (0.4)	0.2 (0.3)
Percent teachers inexperienced	-0.8 *** (-0.9)	-1.3 *** (-1.7)	-1.4 *** (-1.9)
Student/teacher ratio	0 (0)	0 (0)	0 (0)
Enrollment	2.5 *** (2.9)	4.1 *** (5.5)	3.9 *** (5.4)
Rural	1.9 *** (2.2)	3.1 *** (4.0)	3.4 *** (4.6)

<sup>a</sup> Marginal changes are represented as point changes from the baseline. Percentage changes are below in parentheses. Significance is reported based on infinitesimal changes for continuous variables. \*\*\* $p \leq 0.01$ ; \*\* $p \leq 0.05$ ; \* $p \leq 0.10$ .

Marginal changes for each group are calculated using beta coefficients from the pooled regression and sample means from the group of interest.

**Table 4**  
**OLS estimates of first semester grade point average**

	White	Black	Hispanic
Constant	0.44 (0.93)	-0.42 (0.60)	0.19 (0.50)
Female	0.22 *** (0.01)	0.19 *** (0.04)	0.14 *** (0.03)
SAT verbal (scaled 20-80)	0.01 *** (0.001)	0.01 *** (0.003)	0.01 *** (0.002)
SAT math (scaled 20-80)	0.01 *** (0.001)	0.01 *** (0.003)	0.01 *** (0.002)
Graduated in top ten percent	0.30 *** (0.02)	0.26 *** (0.06)	0.25 *** (0.04)
High school GPA (4.0 scale)	0.55 *** (0.02)	0.36 *** (0.04)	0.53 *** (0.04)
Part-time student	-0.16 *** (0.04)	-0.32 *** (0.09)	-0.05 (0.07)
Science=3 years	0.06 ** (0.03)	0.05 (0.05)	0.05 (0.06)
Science>3 years	0.04 (0.03)	0.09 (0.06)	0.01 (0.06)
Foreign language=2 years	0.001 (0.03)	0.12 ** (0.05)	0.08 (0.07)
Foreign language>2 years	0.01 (0.04)	0.10 (0.06)	0.09 (0.07)
High math geometry	0.12 (0.11)	0.20 * (0.12)	0
High math algebra 2	0.26 ** (0.10)	0.13 (0.10)	-0.05 (0.18)
High math trigonometry	0.35 *** (0.10)	0.20 (0.13)	0
High math pre-calculus	0.35 *** (0.10)	0.21 * (0.11)	0.01 (0.18)
High math calculus	0.41 *** (0.10)	0.24 * (0.13)	0.13 (0.19)
Honors English	0.02 (0.02)	0.05 (0.05)	0.02 (0.04)
Honors science	-0.07 *** (0.02)	-0.12 ** (0.05)	-0.04 (0.04)
Honors social science	0.04 ** (0.02)	0.09 * (0.05)	-0.02 (0.04)
AP math	0.01 (0.02)	0.07 (0.09)	-0.08 (0.06)
AP science	-0.01 (0.02)	0	0.10 ** (0.05)

**Table 4, cont.**

	White	Black	Hispanic
AP English	0.01 (0.02)	-0.05 (0.05)	0
AP economics	0.01 (0.03)	-0.06 (0.09)	0.09 (0.06)
AP government	0.03 (0.03)	0.09 (0.08)	0.01 (0.06)
AP history	0.02 (0.02)	0	-0.07 (0.05)
AP psychology	0.03 (0.04)	0.10 (0.10)	0.11 (0.11)
Family income/10000	0.02 *** (0.01)	0.01 (0.03)	-0.03 (0.02)
(Family income/10000) <sup>2</sup>	0	0	0.004 ** (0.002)
Stafford loan	-0.12 *** (0.02)	-0.12 *** (0.04)	-0.07 ** (0.03)
Parent college	0.07 *** (0.02)	0.06 (0.04)	0
Parent high school	0	0	0.04 (0.04)
Percent peers low income	-0.004 *** (0.001)	-0.003 ** (0.001)	-0.003 *** (0.001)
Percent peers SAT/ACT	0.003 *** (0.001)	0.003 ** (0.001)	0.002 * (0.001)
Number AP courses offered	0.002 * (0.001)	0	-0.002 (0.003)
Percent teachers inexperienced	-0.002 ** (0.001)	0	-0.004 ** (0.002)
Student/teacher ratio	0.01 (0.004)	0	-0.01 (0.01)
Enrollment/1000	-0.03 (0.03)	-0.06 (0.08)	0.06 (0.07)
(Enrollment/1000) <sup>2</sup>	0.01 * (0.01)	0.02 (0.02)	0.003 (0.02)
Rural	0.01 (0.02)	0.06 (0.06)	-0.09 * (0.05)
R <sup>2</sup>	0.21	0.20	0.19
N	19,801	3,126	5,240

Standard errors are in parentheses. \*\*\* $p \leq 0.01$ ; \*\* $p \leq 0.05$ ; \* $p \leq 0.10$ .