Journal of Public Economics 146 (2017) 97–108

Contents lists available at ScienceDirect

Journal of Public Economics

journal homepage: www.elsevier.com/locate/jpube

Weighting recent performance to improve college and labor market outcomes☆

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ARTICLE INFO

Article history:
Received 20 April 2016
Received in revised form 30 November 2016
Accepted 6 December 2016
Available online 13 December 2016

Keywords:
College admissions
Grade point average
Student trajectory
Dropout
Graduation
Earnings

ABSTRACT

There is a great deal of policy interest in reducing college dropout rates, increasing graduation rates, and improving labor market outcomes. To this end, individual colleges and state university systems use high school grade point averages and class rankings in an effort to offer admission and scholarships to students who are most likely to achieve long-run success. However, a significant fraction of students exhibit steep positive or negative performance trends during high school. This study shows that academic performance in later grades is given no greater weight in admissions but is the best predictor of college and labor market outcomes, greatly exceeding prior grades and entrance exam scores. Placing greater weight on later grades and extending application deadlines to allow the consideration of 12th grade performance is shown to significantly alter which students are admitted to college and to improve their expected long-run outcomes. Importantly, weighting recent performance does not appear to affect college diversity. Evidence is presented that the predictive power of later grades is driven primarily by students who experience large negative performance trajectories during high school.

1. Introduction

High school grade point average (GPA) is perhaps the single most important determinant of student access to post-secondary opportunities: several states employ policies that guarantee admission to a public university based on class ranking; admissions offices use GPAs to rank applicants; and many colleges and scholarship organizations have minimum GPA requirements.[1] Such policies give equal weight to performance at each high school grade level, implicitly assuming that each grade is equally important for predicting future success. In contrast to this assumption, this paper presents evidence that a student's performance in later grades has far more power for predicting college dropout, on-time graduation, and future earnings than does performance in prior years. Evidence is presented that the predictive power of later high school grades stems in part from persistent trends in student effort. These findings suggest that using grade level GPAs may result in the allocation of enrollment slots and financial resources to students who have higher probabilities of success. Likewise, extending application deadlines would allow the consideration of 12th grade performance, which is most predictive of long-run outcomes. The results have important policy implications in light of the labor market returns associated with college completion and the high cost of increasing enrollment and persistence through financial aid and grants.[2]

Data on high school course grades and state university applications for four Florida cohorts reveal that admissions during the period of study were based on grade point averages, with nearly identical weight given to performance in 9th, 10th, and 11th grades (and less to 12th grade performance, which is only partially revealed

☆ This research was supported by the Hawley-Shoven Fellowship and the Kapnick Fellowship through the Stanford Institute for Economic and Policy Research. I thank the Florida Department of Education for providing the data used in this analysis and Jonathan Blakely in particular for his assistance. The paper benefited substantially from comments by two anonymous referees. The opinions expressed in this paper do not necessarily reflect those of the Stanford Institute for Economic Policy Research or the Florida Department of the Education. Any remaining errors are my own.

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[1] State policies that guarantee admissions based on class rank include the Talented Twenty Program in Florida, the California Master Plan for Higher Education, and the Texas Top 10 Percent Plan. Many universities use a matrix of GPA and entrance exam score to allocate scholarships (e.g. Brigham Young University, the University of Nevada at Las Vegas, and Northern Illinois University). Likewise, the NCAA uses a sliding scale of GPA and SAT score to determine eligibility for athletic scholarships.

[2] For examples of the literature examining the returns to college attainment, quality, and completion, see Jaeger and Page (1996), Kane and Rouse (1995), Brewer et al. (1999), Black and Smith (2006), Card (2001), Long (2010), and Carneiro et al. (2011). Studies of the effect of financial resources on student persistence in college include DesJardins et al. (2002), Bettinger (2004), Cohodes and Goodman (2014), Deming and Dynarski (2010), Dynarski (2008), Glocker (2011), Scott-Clayton (2011), Singell (2004), Stinebrickner and Stinebrickner (2008), and Goldrick-Rab et al. (2016).

http://dx.doi.org/10.1016/j.jpubeco.2016.12.002
0047-2727/

at the time decisions are made). This balance across grade levels is consistent with the common practice among colleges, and large universities in particular, of constructing an admission index using cumulative high school GPA and entrance exam score.[3] However, giving equal weight to each grade level necessarily discards a large amount of information stemming from substantial variation in student performance over the four years of high school. For example, within-student changes in GPA between 9th and 12th grades have a standard deviation of 0.7 points. Among students in the middle quintile of performance in 9th grade, 11% are in the top quintile by 12th grade while 15% are in the bottom quintile.

University enrollment records reveal that performance in later grades of high school is far more predictive of dropout and on-time graduation than performance in earlier grades. For example, one additional GPA point in 11th grade is associated with an increase of 16 percentage points in the probability of graduating from a state university, compared to an increase of 5 percentage points for a GPA point in 9th grade. Similarly, the later GPA point is five times more predictive of dropping out of college within two years. Linked employment records further reveal that 11th grade performance is twice as predictive of labor market earnings as 9th grade performance. Extending the analysis to consider 12th grade performance, which is only partially observed during the admissions process, results in a similar pattern. Performance in the final year of high school is more predictive of graduation and earnings than is performance in prior years. Of particular policy relevance is that differences in performance across grade levels have very weak correlations with students' socioeconomic characteristics.

A concern raised in studies examining the predictive power of entrance exams is the issue of selection into college, as admission and thus attendance is a function of exam scores.[4] This analysis is able to abstract from this challenge in two ways. Because each grade level receives equal weight in admissions, there is essentially no evidence of differential admission and attendance at state universities across students with better or worse performance at different grade levels.[5] Interestingly, this balance does not appear to stem primarily from the policy of guaranteed admission for students in the top 20% of their graduating class. Students were only eligible for this program if they applied to three zuniversities and were rejected by each one, which is the case for a small percentage of applicants observed in the data. The issue of unobserved outcomes is also alleviated by the fact that 92% of applicants are observed attending either a community college or a state university. Specifications that include fixed effects for application portfolios or university attended generate estimates that are nearly identical to those that do not, indicating that the results do not stem from selection into colleges of differing quality.

A number of studies find that exam scores are given disproportionate weight relative to their predictive power and tend to disadvantage lower-income and minority students (e.g., Rothstein, 2004; Scott-Clayton, 2011 and Black et al., 2016). Bettinger et al. (2013) further note that two subsections (Math and English) of the ACT are more predictive than the others (Reading and Science) and thus efficiency is improved if the less relevant sections are ignored. This study finds that the SAT is given a great deal of weight in admissions, but, after conditioning on grade level GPAs, has modest predictive power for dropout, graduation, and future earnings. Thus, differentiating between grade levels contributes an order of magnitude more in terms of potential gains for long-run outcomes and has fewer implications for diversity.[6]

The use of GPA and class rank by colleges and states assumes that each grade level is an equally valuable measure of potential — an assumption that is inconsistent with the empirical evidence and with traditional models of human capital accumulation. Two classes of explanations emerge for why performance in later grades is more predictive of long-run outcomes: 1) student-based explanations in which trends in effort or investment during high school persist into college; and 2) course-based explanations in which the composition or content of classes taken later in high school better reveals college potential. To shed light on the role of persistent changes in effort, I classify students by their trends in performance and find that students on steep downward trajectories disproportionately drive the results. The importance of effort is supported by the finding that performance in non-academic electives taken in later grades, which are unlikely to reflect college-level academic material, is more predictive of college performance than academic and non-academic classes taken in earlier grades. There is less evidence that the power of later grades stems from changes in course composition or difficulty. Specifically, restricting attention to core subject areas that are balanced across grade levels does not significantly alter the results. Likewise, omitting Advanced Placement courses that are taken in later grades and cover college-level material does not reduce the explanatory power of later grades.

The results presented in this paper highlight two potential opportunities for the more efficient allocation of resources. First, conditional on the data available to admissions offices, states, and scholarship organizations, giving greater weight to more recent performance is likely to improve the expected outcomes of selected students. Second, delaying application deadlines to allow the consideration of additional 12th grade performance information would result in the selection of students who are more likely to succeed in college. It is important to note that a systematic change in the weight given to grade level GPAs by a large number of universities could cause students to exert more or less effort throughout high school, thus generating changes in learning and potentially altering the predictive power of performance trends. Abstracting from such general equilibrium issues to focus on the decisions of individual universities, a simple exercise reveals that decisions based on disaggregated grades rather than averages would change the set of admitted students by about 13% for a university with an acceptance rate of 50%, and that new admits would be 10 percentage points more likely to graduate than the students they replace. Importantly, because GPA performance across grade levels is not correlated with demographics, the pool of students admitted using disaggregated grades would be as

[3] A number of universities make the formula they use to compute their indices publicly available. See, for example, Iowa State, Utah State, Alabama State, the University of Memphis, Southern Utah, the University of Southern Florida, the University of Colorado System, the California State University System, and many others. In nearly every case, the index is based on a student's cumulative high school GPA (an exception is California, where 9th grade performance is excluded). While highly selective colleges may have the resources to use a more holistic approach, they too face incentives to use cumulative averages, as rankings such as the U.S. News & World Report consider high school class rank as a measure of selectivity.

[4] See, for example, Rothstein (2004) and Black et al. (2016). In an effort to overcome the issue of selection into college, these studies have exploited the fact some states guarantee admission to a state university if a student has a given class rank or GPA, thus abstracting from the extensive margin of being admitted to a state university due to exam score.

[5] The lack of selection on grade level performance is also apparent at each separate state university, so there is no evidence that students who perform better in later grades relative to earlier grades have access to better undergraduate programs.

[6] The finding that differentiating GPA by grade level does not penalize low-income and minority students is important in light of a large literature which reveals that minor obstacles can deter students from low-income households from attending and persisting in college (e.g. Bettinger et al., 2012, Bulman, 2015, Goodman, 2016, Hoxby and Turner, 2013, Hurwitz et al., 2015, Stinebrickner and Stinebrickner, 2003).