Do Test Scores Have *Any* Pedagogical Value? Examining Socioeconomic Test Score Biases at a Young Age

Mitchell Hanson

March 2, 2023

1 Introduction

In recent years, it's become no secret that college readiness exams like the SAT have lost a lot of their perceived value for student evaluation, with empirical evidence extensively suggesting that test scores are better indicators of socioeconomic status than predictors of student success [3, 1]. The uncertainty surrounding test scores' value to college admissions offices has especially come to the forefront following the pandemic, with many schools who initially made SAT and ACT scores optional as a COVID-friendly measure now deciding to keep their test-optional policies permanently [2]. In the face of the clear bias standardized test scores exhibit towards students of a higher socioeconomic standing, a key question is raised: is there ever a point at which standardized tests can be used to evaluate student ability, or is the socioeconomic bias associated with test scores too implicit at any educational stage? The implications of the answer to this question could dictate the pedagogical importance of standardized testing at not only the college placement level, but throughout the educational process.

2 Methodology

The *third_grade.dta* dataset contains $51,250$ total observations, each pertaining to an individual student in third grade, and each of which may have a value for a given student's school SES index, math test score (0-30), and verbal test score (0-30). I will remove any students from the data set who don't have an assigned value for each of the 3 variables mentioned, leaving me with 50,410 observations. For brevity, I will create a new variable that adds the math and verbal test scores for a total score out of 60. Since the SES Index is a school-wide measurement, I collapse the data to be sorted by school SES Index, comparing mean total scores of each SES-Index to one another. I operate under the assumption that a school's SES Index will be a strong indicator for the expected socioeconomic status of a given student who attends that school.

Once the proper data subsetting has been performed, the process is rather straightforward. I will run a linear regression, regressing mean total score on SES index. The constant term will represent the expected mean total test score out of 60 for a school with an SES index of 0, and the coefficient for the explanatory variable will represent the expected change in average test score for a school with an SES index that is 1 greater. For the purposes of being thorough, I will also run similar regressions with the 75th percentile total score as the dependent variable and with the median total score.

3 Results

Regression of mean total score on SES index

Source	SS	df	MS	Number of obs	=	66
				F(1, 64)	=	16.45
Model	111.969694	1	111.969694	Prob > F	=	0.0001
Residual	435.620254	64	6.80656646	R-squared	=	0.2045
				Adj R-squared	=	0.1920
Total	547.589947	65	8.42446073	Root MSE	=	2.6089

total	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
ses_index	-.06508	.0160458	-4.06	0.000	-.0971351	-.0330248
_cons	52.16066	.6203229	84.09	0.000	50.92142	53.39989

Regression of 75th percentile total score on SES index

Source	SS	df	MS	Number of obs	=	66
				F(1, 64)	=	23.19
Model	62.9083338	1	62.9083338	Prob > F	=	0.0000
Residual	173.621969	64	2.71284327	R-squared	=	0.2660
				Adj R-squared	=	0.2545
Total	236.530303	65	3.63892774	Root MSE	=	1.6471

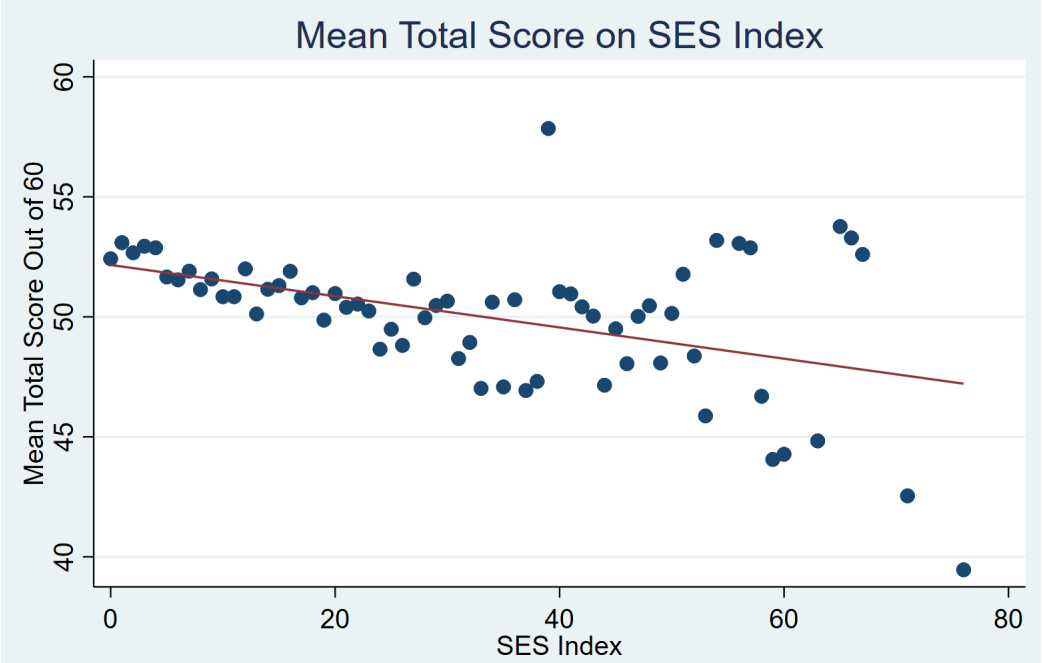
ptotal	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
ses_index	-.048781	.01013	-4.82	0.000	-.069018	-.028544
_cons	57.73468	.3916212	147.42	0.000	56.95233	58.51704

Regression of median total score on SES index

Source	SS	df	MS	Number of obs	=	66
				F(1, 64)	=	19.30
Model	165.10099	1	165.10099	Prob > F	=	0.0000
Residual	547.554313	64	8.55553615	R-squared	=	0.2317
				Adj R-squared	=	0.2197
Total	712.655303	65	10.9639277	Root MSE	=	2.925

medtotal	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
ses_index	-.0790263	.0179896	-4.39	0.000	-.1149646	-.0430881
_cons	54.65173	.6954684	78.58	0.000	53.26238	56.04109

The results are statistically significant for all three regressions at a p-level of 0.001. Consistently throughout the results, I observed a surprising negative relationship between SES index and total scores. For the regression of mean total score on SES, for instance, the SES coefficient is calculated to be -0.0790263, and the true coefficient resides within a 95% confidence interval between -0.0971351 and -0.0330248. The R-squared value of 0.2045 indicates that 20.45% of the variance in mean test scores can be explained by the model. Though the slight negative coefficient can be interpreted as showing the tests bias away from students of better socioeconomic status, I imagine this slight negative skew is more attributed to the small size of the data set. However, it is worthy to note that the results very clearly do *not* display a bias for students of greater socioeconomic standing, indicating that the mechanism by which these biases occur in college-level standardized tests hasn't taken effect at an age as young as third grade. This would imply that, barring other unseen factors, test scores *can* still be used as an evaluation for student ability at younger ages.



4 Conclusion

In summary, my results indicate that, at a young age, test scores are *not* biased by socioeconomic status, and, if they are, would actually be negatively affected by socioeconomic status. These observations may point towards a potential mechanism by which SES affects test scores. This mechanism would have to be observed at a later age in schoolchildren, and potentiates further research. My research expands the field of educational economics' understanding of the importance of test scores and supports a continued usage of test scores at primary school levels. These results would need to be verified by deeper and more expanded research, ideally on an individual student basis. With a deeper dataset, these results could be far more significant in terms of their implications for educational policy.

References

[1] Chetty, R., Friedman, J. N., Saez, E., Turner, N., and Yagan, D. (2020). Income Segregation and Intergenerational Mobility Across Colleges in the United States*. *The Quarterly Journal of Economics*, 135(3):1567–1633.

[2] Jimenez, K. (2023). Sat, act testing requirements paused during pandemic are now permanently optional at some colleges.

[3] Rothstein, J. M. (2004). College performance predictions and the sat. *Journal of Econometrics*, 121(1):297–317. Higher education (Annals issue).