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State preferences for the ACT versus SAT complicates inferences about SAT-derived state IQ estimates: A comment on Kanazawa (2006)

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Abstract

Kanazawa [Kanazawa, S. (2006). IQ and the wealth of states. *Intelligence*, *34*, 593–600.] offered estimates of state IQ derived from SAT data. The purpose of this commentary is to argue that state preferences for the use of the ACT versus the SAT create biased estimates of SAT-derived state IQ for states where the ACT is more frequently used than the SAT. This error can be reduced by using both ACT and SAT data to estimate state IQ. An IQ estimate based on a ACT-SAT composite and a NAEP-derived state IQ estimate were compared as predictors of three wealth variables. Both IQ estimates cause one to conclude that states with higher mean IQ have larger gross state product per capita, higher median incomes, and a lower percentage of their population in poverty.

Keywords: Intelligence; IQ; State IQ; SAT; ACT

1. Introduction

Kanazawa (2006) offered a creative approach for estimating state IQ from SAT scores. He noted that his method is based on two assumptions, quoted here verbatim:

1. Students who complete high school are uniformly more intelligent than those who do not.
2. High school seniors who take the SAT are uniformly more intelligent than those who do not.

Relying on these assumptions, Kanazawa (2006) estimated mean state IQ from SAT data. An example detailing his method is provided in the appendix of his article.

2. State preference for ACT or SAT makes the SAT-derived IQ estimate differentially accurate

Kanazawa's assumptions are reasonable if states have the same level of preference for requiring the SAT for college admissions. However, this is not the case. There are two primary tests used to screen applicants for colleges in the United States, the SAT and the ACT. The last two columns of Table 1 show the percentages of 2005 high school graduates who took either the ACT or the SAT. An inspection of the table indicates that states with many students taking the SAT tend to have few students taking the ACT, and vice versa. Table 2 shows the correlation between the percent of students

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taking the SAT and the percent of students taking the ACT to be −.90.

Table 2 shows that Kanazawa's SAT-derived IQ measure is correlated .93 with the percentage of 2005 high school graduates who took the SAT and −.86 with the percentage of 2005 high school graduates who took the ACT. Thus, it appears that the SAT-derived IQ measure is primarily an indicator of the extent to which state colleges prefer to have ACT versus SAT administered to their applicants. Most would not find it reasonable for an accurate estimate of state IQ to show such a pattern of correlations.

I assert that Kanazawa's SAT-derived IQ estimate is differentially accurate by state. For those states in which the SAT is the preferred college admissions test, the estimated state IQ scores should be more reflective of true state IQ than in those states where the use of the ACT is common. This assertion was tested with two analyses. For each analysis, the states were divided into those where more than half of the 2005 high school graduates took the ACT (the "ACT states") and those where fewer than half of the students took the ACT (the "SAT states"). Each analysis also uses a National Assessment of Educational Progress (NAEP)-derived estimate of state IQ. McDaniel (in press) developed the NAEP-derived state IQ estimate using the fourth and eighth grade reading and mathematics test scores from multiple years.

The first analysis compared the SAT-derived and NAEP-derived state IQs of the 25 ACT states with the 26 SAT states (the District of Columbia is considered a state in Kanazawa's analysis). The mean SAT-derived IQ for the ACT states is 82.5 while the mean for SAT states is 105.0. This difference, expressed as a standardized mean difference, is 3.5 standard deviation units. Thus, either states that favor the use of the ACT have severely cognitively impaired residents or something is amiss with the SAT-derived IQ measure. Note that the SAT-derived IQ measure has some large outliers. Twelve states have estimated state IQs below 80. Some would argue that these state IQ values are not credible. All states with SAT-derived IQ values below 97 are ACT states. In contrast to the odd behavior of the SAT-derived IQ estimate, the NAEP-derived IQ estimate showed no meaningful mean differences between ACT and SAT states (100.32 versus 100.36) and had no outliers.

The second analysis correlated the SAT-derived and NAEP-derived estimated state IQs separately by ACT and SAT states. If SAT-derived state IQ estimates are more accurate for SAT states, the correlation between the SAT-derived IQ and the NAEP-derived IQ should be substantially higher for the SAT states than for the ACT states. For the SAT states, the correlation between the two state IQ estimates is .77. The comparable correlation for the ACT states is .36. Thus, one must conclude that the SAT-derived IQ measure is substantially inaccurate in its estimation of NAEP-derived state IQ scores in ACT states.

3. An ACT-derived IQ shows comparable problems as the SAT-derived IQ

Kanazawa's method was applied to obtain an ACT-derived IQ. The ACT-derived IQ measure shows comparable problems to the SAT-derived IQ. Table 1 shows the ACT-derived IQ for each state with the exception of Colorado and Illinois. Those two states require the ACT for all high school students and therefore are problematic for the application of Kanazawa's method. Table 2 shows ACT-derived IQ to be correlated −.84 with the SAT-derived IQ. The ACT-derived IQ shows a positive correlation with the percentage of high school graduates who take the ACT (.94) and a negative correlation with the percentage of the high school graduates who take the SAT (−.90). These correlates would not be reasonable for measures of IQ.

In a comparable manner to the SAT-derived IQ, the ACT-derived IQ is differentially accurate. For those states in which the ACT is the preferred college admissions test, the estimated state IQ scores should be more reflective of true state IQ than in those states where the use of the SAT is common. The mean ACT-derived IQ for the SAT states is 88.3 while the mean for ACT states is 109.7. As noted earlier there is no meaningful differences between ACT and SAT states for the NAEP-derived IQ (100.32 versus 100.36). I also examined the correlations between the ACT-derived IQ and the NAEP-derived IQ separately by ACT versus SAT states. For SAT states the correlation is negative (−.27), but is positive for the ACT states (.67). Thus, an ACT-derived IQ estimate has comparable problems to an SAT-derived IQ estimate.

4. An ACT–SAT-derived composite IQ and SAT-derived IQ composite

The SAT-derived IQ has a reasonable correlation (.77) with the NAEP-derived IQ in SAT states and the ACT-derived IQ has a reasonable correlation (.67) with the NAEP-derived IQ in ACT states. Given this, I developed a composite of ACT- and SAT-derived IQ. First, the ACT- and SAT-derived IQ scores were