

A New Approach to Measuring Academic Underachievement

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Gifted pupils underachieve as much as non-gifted pupils and class size is associated with underachievement.

Academic underachievement is detrimental for both the individual pupils and the society. Underachievers exhibit a severe discrepancy between expected achievement and actual achievement, not due to learning disabilities. This is different from low achievers who have poor outcomes relative to their peers but do not necessarily underperform given their potential.

Measuring underachievement is challenging

As pupils' potential is essentially unobserved, it has been very difficult to measure underachievement. Practitioners such as student counsellors mostly use the nomination method in which teachers, parents or peers nominate underachievers based on a question such as "how well is this child performing in reading compared to how well you believe she could?". However, this method is entirely subjective, and it is especially difficult to identify gifted underachievers.

These pupils typically have reasonable grades but still perform under their potential. Moreover, there may be disagreement about who is an underachiever based on the person doing the nominating. Teachers may disagree with the parents that, in turn, may disagree with the pupils' peers. For this reason, the academic literature mainly uses another approach to identify underachievers, namely the absolute split method.

Specifically, pupils' aptitude test scores (for instance an IQ test) are compared with achievement test scores (for instance mathematics or reading tests). Pupils who score above a certain threshold on the aptitude test but below a certain threshold on the achievement test are then defined as underachievers. Although less subjective than the nomination method, it is still necessary to subjectively choose the thresholds. Moreover, this approach assumes both tests are measured without error and it does not allow the researcher to control for contextual factors such as school, class and teacher characteristics.

Academic underachievement as production inefficiency

To tackle the issues of subjectivity, measurement error, and lack of contextual factors that characterize the nomination and the absolute split method, [we used a novel approach](#) from production economics called Stochastic Frontier Analysis. This method treats achievement as a production process with certain inputs (e.g., pupil and teacher characteristics) and certain outputs (e.g., mathematics or reading scores). The potential output is calculated based on inputs and contextual factors and the difference between the potential and the actual output is considered as production inefficiency.

We used data from the Flemish region of Belgium and observed 2,228 children in 168 schools over 6 years of primary education. Our output was a mathematics test score in each year of primary education. Thus, we estimated the potential mathematics test scores a child could achieve (based on a

child's ability as measured by the IQ score) and compared it with the mathematics test scores the student actually achieved, while keeping contextual factors such as gender, socioeconomic status and teacher characteristics constant.

Consequently, we propose a realistic benchmark that students are able to attain, rather than an idealistic benchmark obtained by a simple comparison of IQ scores to achievement test scores – as obtained by the earlier methods. Moreover, we account for measurement error, and we do not have to choose arbitrary thresholds.

Academic underachievement is high

Using our novel approach to underachievement, we found that children in Flemish primary education do not use about one fourth of their potential. We saw no significant differences by gender and origin. Interestingly, gifted children (IQ in the top 10 percent) underachieve just as much as other children.

We also found that class size is a determinant of underachievement, and that underachievement is minimal at a class size of about 20 pupils. Above a class size of 20 pupils, a larger class seems to exacerbate underachievement. Below a class size of 20 pupils, larger classes may actually reduce underachievement.

Note, however, that these are associations and not causal relationships. Nonetheless, a contribution of our research is that we related class size to underachievement (how does a pupil score on a test relative to their potential), whereas the previous literature focused on achievement (how does a pupil score on a test).

Advice to policy makers and teachers

These results are especially important for policy makers, but also teachers. Policy makers should take into account that children do not use much of their potential and that class size can be an important way to tackle underachievement.

Initiatives should be tailored to the needs of students in order to further tackle underachievement. Teachers should take into account that high ability pupils also underachieve. Even though these students often display either average or high scores on the tests, many of these students could do even better. Thus, it is important to stay alert and not only focus on students who struggle with the course material, but also students who are bored or daydreaming.

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