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The influence of height on academic outcomes☆

Devon Gorry

Utah State University,3565 Old Main Hill, Logan,Utah, 84322, United States

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ABSTRACT

This paper examines whether the height premium for academic outcomes is driven by unequal opportunities for tall individuals. Using data from the National Longitudinal Survey of Adolescent Health, this paper shows that taller individuals typically earn higher grades and attain more schooling, but the associations are not uniform across school size. Height is only associated with better outcomes for students attending large schools and these improvements are concentrated among males. Data suggest that height contributes more to sports participation and school satisfaction in large schools where resources are more scarce. Thus, differential opportunities or treatment across height in large schools may drive the performance differences.

1. Introduction

It has been well established that height is correlated with improved outcomes along a number of dimensions, including educational achievement, labor market outcomes, an d health.[1] Although taller people have better average outcomes, the reasoning is still debated. Are taller people given more opportunities in school, favored in the labor market, and treated differently than their shorter peers or is height just associated with better childhood environments and a superior cognitive endowment? The answers to these questions have different policy implications. If height leads to differential opportunities for children in school, then policy may improve the disparities.

Persico, Postlewaite, and Silverman (2004) find that teenage height, not adult height, matters for labor market outcomes. Their finding suggests that labor market discrimination is not a major factor contributing to the height premium and indicate that adolescent experiences may play a role in the association between height and wages. They argue that taller students could have more access to clubs or social activities that develop human capital and lead to improved labor market outcomes. Thus, even without discrimination in the labor market, there may be unfair advantages to being tall during one's school years.

Alternatively, Case and Paxson (2008a, 2008b) provide evidence for a different explanation: average height reflects cognitive ability. Differences in genetics, health, and early environmental factors are related to physical growth as well as cognitive development. Thus, children who are endowed with good genes or grow up in a healthy environment are not only more likely to grow taller, but they also perform better in school and excel in the workplace due to higher cognitive function. This superior cognitive development can cause associations between height and improved outcomes. Case and Paxson (2008a, 2008b) find that height premiums in wages diminish when childhood test scores are included as a proxy for cognitive development. Furthermore, the authors show that taller, healthier individuals achieve their growth spurts earlier in life leading to larger height differences during adolescence. This greater height disparity during teenage years can explain why teenage height is more significant than adult height in the results of Persico et al. (2004).

Given that the literature provides different explanations for the association of height and outcomes, this paper further assesses

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E-mail addresses: devongorry@gmail.com, devon.gorry@usu.edu

[1] Past literature shows that taller students perform better in the classroom and on cognitive tasks and attain more schooling (Case & Paxson, 2008a; 2008b; 2010; Cohen, 2009; Downie, Mulligan, Stratford, Betts, & Voss, 1997; Heineck, 2009). Papers since early 1900s report that height is associated with improved labor market outcomes such as employment and wages (Gowin, 1915; Behrman and Rsenzweig, 2001; Case & Paxson, 2008a; 2008b; 2010; Case, Paxson, & Islam, 2009; Hübler, 2009; Loh, 1993; Sargent & Blanchflower, 1994). This height premium is often large in magnitude, with taller workers earning 4–6% more than their shorter counterparts (Loh, 1993). Finally, research indicates that taller individuals also have better health outcomes and live longer (Case & Paxson, 2008b; 2010; Cohen, 2009).

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Table 1
Resources across school size.

	Top quartile of school size	Bottom quartile of school size
Student teacher ratio	23.51	13.66 ***
Sport participation	0.43	0.63 ***
Club participation	0.36	0.52 ***
Best female friend is from own school	0.76	0.83 ***
Best male friend is from own school	0.74	0.81 ***

Significant differences across school size are indicated. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

this relationship by examining whether the associations between height and outcomes are uniform across school size. If taller students are better at capturing limited opportunities or resources as suggested by Persico et al. (2004), then we would expect height to matter more in large schools where there is more competition for scarce resources. Using data from The National Longitudinal Study of Adolescent Health (AddHealth), Table 1 shows that opportunities are more limited in larger schools. Relative to the smallest quartile of schools, the largest quartile of schools has higher student teacher ratios, fewer students participating in school sports, and fewer students in other clubs. In addition, Table 1 shows that fewer students in large schools report that their best friends come from the same school, suggesting that it may be harder to make close relationships in big schools. If height helps one access more school resources or make better connections with teachers and friends, then height should matter more in large schools. If these factors affect outcomes, then the association between height and educational outcomes should be stronger in large schools. This paper tests whether height associations differ across school size.

First, this paper confirms that height is associated with improved academic performance. Taller students earn higher grades and attain more schooling, with performance gains driven by improvements for tall males. Next, this paper shows that the relationship between height and outcomes is in fact strongest in large schools. That is, tall male students typically outperform their peers in large schools, but for students who attend small schools height is not correlated with better outcomes. While previous research establishes a link between height and improved outcomes, this paper is the first to show that the association varies across school size. Controlling for health and parental background often diminishes the average height relationship, but it does not eliminate the differential relationship across school size. The results suggest that large school settings may favor tall individuals and contribute to the height premium.

The paper proceeds as follows: Section 2 provides an overview of the data; Section 3 details the differential associations of height across school size; Sections 4 and 5 explore the role of extracurricular participation and school satisfaction in explaining these associations, respectively; and Section 6 concludes.

2. Data

AddHealth is a survey of health related behaviors and outcomes of adolescents from middle and high school years into young adulthood. AddHealth is a school-based survey that interviewed students from a stratified random sample of high schools and middle schools across the country. Schools were chosen in an attempt to obtain a representative sample of the United States with respect to region of country, urbanicity, school size, school type, and ethnicity. Students within each school were surveyed at random. Due to oversampling in some categories, sample weights are used throughout the analysis. The analysis for this study focuses on a subsample of students who attended non-urban high schools.[2] This sample includes approximately 67 schools and over 4000 students. The schools from which students are sampled range in size from 47 students to 2590.

AddHealth consists of four rounds of surveys. The first wave of the study, in 1994-95, targeted 7th through 12th graders. In addition to the in-home and parental surveys conducted on the longitudinal participants, an in-school survey was administered to all students as well as a separate survey for administrators. The following year, wave 2 of the study conducted another round of in-home interviews and phone conversations with school administrators. The wave 3 and 4 follow-up surveys occurred from 2001 to 2002 and from 2008 to 2009, respectively. In addition to more in-home interviews, the third wave also gained permission from participants to collect past high school records.

The independent variables of interest are height and height interacted with cohort size. This paper uses physical height measurements that are taken by the interviewer in the second round of surveys.[3] This height represents a student's height in high school, which is the relevant height measure if height matters for schooling outcomes. This is also the height that Persico et al. (2004) found to be most predictive of adult wages. Students who were in grade 12 were not contacted for the second round of surveys. Therefore only participating students who initially started in grades 9–11 are included in the study. Cohort size is constructed using the schools reported enrollment, dividing by the total number of grades at the school, and multiplying by the number of high school grades. Thus, the size variable represents the size of the high school cohort at one's school. This is the relevant size variable since this is likely the pool of students that compete for similar resources.[4]

The dependent variables include outcome data from the first, third, and fourth survey waves. The wave 1 in-school questionnaire asked students to self-report their most recent grades for English,

[2] Only non-urban schools are used in an attempt to keep other differences to a minimum. Urban schools differ substantially from suburban and rural schools not only due to their very large size, but also on other schooling characteristics such as student resources, population in poverty, and student body composition. Approximately 26% of the AddHealth sample, which is representative of the U.S., is urban. This is consistent with reports from the National Center for Education Statistics (see U.S. Department of Education, 2005 where they report 28.8% of public school students in a central city location). The results found in this paper do not apply for urban schools.

[3] Self reported height is also recorded; however, given that self reported height tends to be over estimated (see Brener, Mcmanus, Galuska, Lowry, & Wechsler, 2003) this paper uses the height that is measured by the interviewer. Results, however, are similar with self reported height. Self reported heights as well as third round measured heights are used to find errors in the recording of measured heights. In particular, when self reported height and future measured height are both much shorter or both much taller than the recorded height, it is assumed that the feet were recorded improperly and a correction is made. This only occurs in 6 cases and results are not sensitive to correcting, omitting, or keeping the original measurements.

[4] The results are robust to defining size in other ways such as using school size or class size for schools that have grades 9–12 and defining school size as the size of the 9th or 10th grade cohort.