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Economics of Education Review

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

Single-sex classes & student outcomes: Evidence from North Carolina[☆]

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ARTICLE INFO

Article history:

Received 30 May 2012

Received in revised form 25 May 2013

Accepted 6 June 2013

JEL classification:

I20

I21

I28

Keywords:

Educational economics

Education policy

Resource allocation

ABSTRACT

The effects of single-sex education are hotly contested, both in academic and policy circles. Despite this heated debate, there exists little credible empirical evidence of the effect of a U.S. public school's decision to offer single-sex classrooms on the educational outcomes of students. This study seeks to fill this hole. Using administrative records for third through eighth graders in North Carolina public schools, the paper finds evidence that the offering of single-sex mathematics courses is associated with lower performance on end-of-grade math exams, and finds no evidence that the offering of single-sex reading scores increases performance on reading exams. Robustness checks are conducted. While the mathematics results are robust to the checks, the reading results fail an important check, and the baseline reading results should be interpreted with this in mind. Evidence of significant heterogeneity in the effect across schools is also presented.

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1. Introduction

The No Child Left Behind Act of 2001 (NCLB) instituted many reforms in public education. Among them was a provision which allowed public school districts to use funds to offer single-sex schools and single-sex classes. In October 2006, the U.S. Department of Education followed up on NCLB by amending Title IX, thereby granting school districts even greater flexibility to offer single-sex schools and classes (U.S. Department of Education, 2008).

These reforms seem to be having an effect – school districts are responding by offering single-sex programs. The National Association for Single Sex Public Education (NASSPE), a nonprofit whose purpose is to advance

single-sex programs, reports that as of January 2009 there were at least 518 public schools in America which offered single-sex programs. At least 95 of the 518 schools were single-sex schools, as opposed to schools with single-sex classes (NASSPE, 2009). During the 1990s, only a handful of public schools with single-sex programs existed (U.S. Department of Education, 2008).

Despite the proliferation of single-sex programs and a heated debate about the efficacy and discriminatory effects of single-sex education, there is little credible empirical evidence on whether enrollment in single-sex programs enhances the educational outcomes of students in public schools.

This paper contributes to the small number of existing studies on single-sex education by estimating its effect on students enrolled in North Carolina in grades three through eight. For reasons discussed later in the paper, a student receives the treatment if she is enrolled in a school which offers single-sex classes, and not if she sits in a single-sex classroom. The treatment effect is identified using a difference-in-differences estimation strategy which exploits the previously-discussed policy changes in value-added regression models.

[☆] I thank John Abowd, Kiel Albrecht, James Cowan, Ronald Ehrenberg, Kevin Hallock, George Jakubson, Eamon Molloy, Ben Ost, Ian Schmutte, Douglas Webber, Kenneth Whelan, two anonymous referees, and the editor for very helpful comments and discussion. Special thanks are owed to Kirabo Jackson. Regan Kuchan provided excellent research assistance. All errors are mine.

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Data on which schools offer single-sex classes in which years and for which grades are taken from the Student Activity Reports (SAR) database from the North Carolina Education Research Data Center (NCERDC), which records the distribution over gender for all activities (included mathematics and reading/English classes) in North Carolina public schools. The dependent variables in the regressions are the number of days a student is suspended from school and the standardized end-of-grade reading and mathematics scores of North Carolina public school students, also provided by the NCERDC.

Five main findings are presented in this paper. (1) There is evidence that offering single-sex mathematics classes hurts the performance of students on their end-of-grade math exams. (2) While the evidence that single-sex reading/English classes hurt student outcomes is significantly less strong than the evidence for math, we can say that there is no evidence that offering single-sex reading/English and mathematics classes in a school-year-grade is associated with *higher* average end-of-grade reading scores. (3) There is significant heterogeneity in the effect of single-sex classes across schools. (4) There is weak evidence of a discriminatory effect due to these single-sex programs. (5) There is no evidence that these classes have an effect on the number of days a student is suspended from school.

The rest of this paper is organized as follows. Section 2 briefly surveys the related literature. Section 3 discusses the data, and presents a detailed discussion of the method of coding the treatment variable. Section 4 discusses the empirical strategy and the regression models estimated in this study. Section 5 presents sample statistics, the baseline results of the estimation, investigates the sensitivity of the results to different control variables, and presents a falsification test. Section 6 offers a concluding discussion with suggestions for future research.

2. Related literature

This paper studies the effect of single-sex education on the educational outcomes of students. There are many reasons to believe that single-sex programs would enhance educational outcomes. Single-sex programs might enhance educational outcomes by decreasing distractions in the classroom; by allowing teachers to cater teaching methods and style to personality differences between genders; by increasing teachers' ability to maintain order in and control of the classroom; by facilitating better peer interactions among students; by giving students greater freedom to pursue activities and goals which are stereotypically assigned to members of the opposite sex¹; by removing the need for teachers to take into account the different maturity levels of elementary-school-aged boys and girls; by allowing students to have

teachers of their own gender who could serve as a more effective role model to the students²; less sex-bias in student/teacher interactions; and by facilitating a greater sense of community in the classroom.

At the same time, there are many reasons to believe that single-sex programs would be detrimental to educational outcomes. For example, instead of giving students greater freedom to pursue activities and goals stereotypically assigned to the opposite gender, segregating schools/classes by sex might easily have the opposite effect of enforcing those stereotypes. Instead of enhancing teachers' ability to maintain order and control of their classes, single-sex classes might decrease that ability by concentrating unruly students in the same classroom. Perhaps most importantly, if single-sex programs affect educational outcomes for one gender but decrease them for the opposite gender, then it may be discriminatory to allow single-sex programs to continue.³

It is also important to note that single-sex programs are not generic. Some schools are reportedly implementing innovative teaching techniques to compliment their single-sex classes. An all-boys mathematics class, for example, might find the students standing in a circle throwing a football to each other while the teacher quizzes the students on their multiplication tables. At the same time, other schools may simply be separating students by gender while continuing traditional instruction. It may be that the effects of these two single-sex programs are different.

For a starting point, we may turn to the literature on peer effects. There is evidence that peer effects exist in classes. An increase in the proportion of girls in a classroom has been shown to significantly affect educational outcomes – classroom disruptions and violence are decreased, inter-student and student–teacher relationships improve, teacher fatigue lessens, and student satisfaction increases (Lavy and Schlosser, 2011). Hoxby (2000) finds that classes with a higher proportion of girls perform better in writing and math, and attributes this to classroom conduct. Girls may respond more strongly to peer influences than boys (Han & Li, 2009).

Peer effects also seem to be present at the college-level: Students at women's colleges are more likely to study traditionally male subjects (Solnick, 1995; Billger, 2002). Peer effects in single-sex schools have been shown to drive student performance in mathematics: Girls in Thailand see their math scores increase when they enroll in single-sex schools, while the single-sex environment decreases boys' math scores (Jimenez & Lockheed, 1989). However, there may be a large difference between a classroom with a high proportion of female students and a classroom with *only* female students.

In addition, these studies were published over a period of two decades and study a wide range of settings, so it would be imprudent to assume a strong relationship

¹ Schneeweis and Zweimueller (2012) study the impact of the gender composition in coed classes in earlier grades on selecting into a school type at age fourteen for female students using data on the Austrian secondary school system. They find that females are more likely to choose a traditionally male school type if they were exposed to a higher share of girls in previous grades.

² Cho (2012) finds little support for this hypothesis using data from fifteen OECD countries.

³ This paper will use the word discriminatory to describe a policy which benefits students of one gender at the expense of the other. The word is not being used in its legal sense, nor is it used to ascribe motivation.

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