Economics of Education Review 39 (2014) 38–49

Contents lists available at ScienceDirect

Economics of Education Review

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

A teacher like me or a student like me? Role model versus teacher bias effect

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ARTICLE INFO

Article history:
Received 27 August 2012
Received in revised form 28 November 2013
Accepted 4 December 2013
Available online 19 December 2013

JEL classification:
I20
J24

Keywords:
Teacher–student gender matching
Academic achievement
Economic impact

ABSTRACT

Several studies have found that teacher–student gender matching has positive effects on student achievement. However, the underlying mechanisms that explain this effect have not been empirically explored. This paper studies the impact of same gender teachers on academic achievement for a large sample of 8th graders in Chile. I provide evidence that girls benefit from being assigned to female teachers, while there is no negative effect on boys. More importantly, I provide evidence that the positive effect is due to role model effects and not to teacher bias effects.

1. Introduction

Numerous studies have documented a gap in the average educational achievement between boys and girls. This gap is especially important in math and language, with boys outperforming girls in math and girls outperforming boys in language. In Chile in 2009, the gender gap in a standardized test taken by 8th grade students was 0.19 standard deviations in math and −0.23 standard deviations in language.[1] This gap is also present in developed countries such as the United States, Australia and England (Mead, 2006). In the United States, using the 1999 NAEP Scores for 13 year old students, the gender gap was 0.083 standard deviations in math and −0.305 standard deviations in reading (Dee, 2007). Fryer and Levitt (2010) document a gender gap in math in the United States across every stratum of society.

It is important to understand the factors determining this gap, because it may drive gender differences in the labor market. For example, women in Chile tend to study fields leading to careers in education and health, whereas men tend to study fields leading to careers in science and math, which on average are associated with higher wages. This may have implications for women's returns to schooling and may relate to occupational segregation and earnings inequality by gender (Loury, 1997).

One explanation that has been discussed in the literature emphasizes the gender of language and math teachers. First, the gender of the teacher can have an effect on students' behavior through role model effects or through stereotype threats (see Dee, 2007). If we think of teachers as role models, and if students identify themselves more with same-sex role models, then it is possible that performance will be enhanced when students are assigned to a same gender teacher.[2] The same result is

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[1] These numbers were calculated as the male mean test score minus the female mean test score using data from the Measuring the Quality of Education test.

[2] As discussed in Basow and Howe (1980), "Because part of role modelship is identification, both sexes should be more influenced by same rather than other sex models."

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http://dx.doi.org/10.1016/j.econedurev.2013.12.001

also consistent with the theory of stereotype threats, which states that, in the case of negative stereotypes against a group, group members may internalize the stereotypes as explanations of their own behavior (see Holmlund & Sund, 2008). In both cases, it is the student who is reacting to the gender of the teacher.

Second, the teacher gender may matter because of teachers' behavior. For example, teachers might have a preference toward students of their own sex, and hence female (male) teachers will structure their classrooms in ways that enhance girls' (boys') learning. If not preferences, gender stereotypes about students may influence teachers' behavior. In both cases, it is the teacher reacting to the gender of the student.

Several studies have found that teacher–student gender matching has positive effects. At the college level, Bettinger and Long (2005) show that the presence of faculty members of the same gender has a positive and significant impact on course selection and on choice of major. Hoffmann and Oreopoulos (2009) find that teacher gender plays little or no role in student achievement and choice of field. The effect appears driven more by males performing worse when assigned to a female teacher, with no effect for females. Carrell, Page, and West (2010) find a limited impact of teacher gender on male students' achievement, while it has a powerful effect on female students' outcomes.At the high school level, Nixon and Robinson (1999) estimate the effect of the percentage of high school female faculty on female years of schooling, high school graduation, enrollment in college and graduation from college. They find a positive effect of female faculty on female students, with no effect on male students. Holmlund and Sund (2008) use a large dataset of secondary students in Sweden and find no effect. Ehrenberg, Goldhaber, and Brewer (1995) also find no effect on students' test scores, but a positive effect on teachers' subjective evaluations.

At the middle school level, Dee (2007) finds that assigning an opposite gender teacher lowers student achievement, as well as affecting teacher perceptions of student behavior, with teacher perceptions more negative for opposite gender students. Ammermueller and Dolton (2006), using the same methodology as Dee (2007), find positive gender interactions for England but not for the United States. Cho (2012) uses data from the Trends in International Mathematics and Science Study to investigate the impact of teacher–student gender matching in 15 OECD countries. The results show that teacher's gender has no impact on student test scores in eight countries, has a positive impact on boys' test scores in four countries, and has a positive impact on girls' test scores in the remaining three countries. Moreover, the positive impact can be explained by differences in teacher quality.

Few studies explore the mechanisms through which the gender of the teacher impacts student achievement. Nixon and Robinson (1999) argue that, because the effect of a female teacher on boys is negative or zero, they can rule out explanations such as female faculty being better teachers or schools with a higher proportion of female faculty being better schools. Carrell et al. (2010) distinguish the effect of professor gender itself from the role of other professor characteristics that are correlated with gender. To do this, they estimate each professor's average value added separately for men and women, and they include the estimated value added as a control variable. However, these studies cannot rule out teacher bias effect. Hoffmann and Oreopoulos (2009) argue that, because they focus on large undergraduate classes where teachers do not grade students' exams and students do not typically receive differential treatment from teachers, they can attribute the effect to role model effects and not to teacher bias effects.

In this study, I investigate the effect of the teacher gender on the educational achievement of boys and girls for the case of Chile. My study contributes to the literature in several ways. First, I use the matched pairs approach suggested by Dee (2007) to control for individual unobserved characteristics, but I also control for students' subject specific propensity for achievement, which could have biased previous studies. Second, and more importantly, I present a theoretical framework that provides some clear empirical predictions that can be tested with the data to determine whether the positive effect is due to teacher bias effect or role model effect. I provide evidence that suggests that the gender interaction effect can be attributed to a role model effect and not a teacher bias effect.

Section 2 develops a theoretical framework to understand the mechanisms through which gender matching could have a positive effect. Sections 3 and 4 introduce the data and the econometric framework used in this study. In Section 5, the main results are analyzed and the internal validity of the estimates is discussed. Section 6 presents evidence regarding the possible mechanisms, and Section 7 concludes.

2. Theoretical framework

As discussed in Section 1, student–teacher gender matching can be beneficial for students for different reasons. This section develops a model of student learning and teacher time allocation, which allows learning to be affected by role models, and allows teachers to have a preference toward their own gender. I first show that there could exist a positive effect of gender matching due to role model effects and/or teacher bias effects. Second, to distinguish between role model effects and teacher bias, I explore the different predictions from these two theories.

2.1. Teacher decision

Suppose the teacher has a fixed number of hours to allocate to teaching and can divide them into hours of teaching devoted to boys, h_1, and hours of teaching devoted to girls, h_2. The teacher can have a preference toward his or her own gender, which is captured by $\alpha_t \leq 1$, where $t \in \{1,2\}$ for male and female teachers, respectively. The maximization problem for the teacher is the following:

$$\text{Max}_{h_{1t},h_{2t}} V_t = \sum_{i=1}^{2} \alpha_{it} \frac{N_i}{N_1 + N_2} U(h_{it}) \quad \text{s.t.}\, \bar{h} = h_{1t} + h_{2t} \qquad (1)$$

where U is an increasing function and

$$\alpha_{it} = \begin{cases} 1 & \text{if } i = t \\ \alpha_t \leq 1 & \text{otherwise} \end{cases}$$