



## Conditional gender peer effects?

Jon Marius Vaag Iversen<sup>a,\*</sup>, Hans Bonesrønning<sup>b</sup>

<sup>a</sup> Center for Economic Research at NTNU, NTNU Dragvoll 7491 Trondheim

<sup>b</sup> Norwegian University of Science and Technology and Norwegian Business School BI, NTNU Dragvoll 7491 Trondheim



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### ABSTRACT

The current empirical literature on peer group effects in schools highlights that credible causal peer effects cannot be estimated unless parental sorting is taken into account. Motivated by a small theoretical literature that discusses resource allocations within schools, the present paper highlights that causal peer effects might be conditional on the learning environment in which they occur. By exploiting a rapid change in the level of special education in the Norwegian elementary school in the period 2007–2009, we present indicative empirical evidence that gender peer effects in the Norwegian elementary school are conditional on the level of special education provided.

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### 1. Introduction

Following the 1966 Coleman report, many empirical analyses provide evidence that individual student achievement is affected by the peers in the classroom. Usually, peer effects are estimated while holding teacher characteristics, and the other factors that are assumed to affect student performance, constant. Most of these analyses do not take into account that peer effects might interact with other characteristics of the school organization—even though it seems quite likely that such interactions are important. For instance, causal peer effects might be conditional upon the average teacher quality, or in general, on the resources and institutions that characterize the educational system under scrutiny.

The purpose of the present paper is to contribute to the discussion about conditional, or context-dependent, peer effects. We do this by using the gender composition of the student body in the grade-in-school as our peer measure. This peer characterization speaks to the broad discussion about boys' maladjustments to schools and vice versa, and is used in influential empirical analyses (to be presented in the next section). Our research strategy requires access to contextual factors that vary within-school over time: we take advantage of the rapid increase in the proportion of students receiving special education that has occurred in the Norwegian elementary school system in the period from 2007 to 2009.

Special education resources might reduce the congestion of Lazear-type congested classrooms (Lazear, 2001), and moreover, since special education resources are targeted resources, they might affect gender peer group effects if they are disproportionately allocated to misbehaving male students. The main hypothesis to be investigated is thus that the magnitude of gender peer effects decreases when special education increases. Two of the institutions that characterize the Norwegian elementary school system might be of particular importance for this part of the analysis. First, misbehaving students have the legal right to special education resources, implying that disproportionate proportions of special education resources actually are allocated to misbehaving boys. Second, compulsory schools are required to practice a full inclusion policy, implying that (almost) no students are excluded from ordinary schools, and special education is offered within ordinary classrooms.

Various approaches to student misbehavior (such as early intervention, behavioral programs, and school-home partnerships) are discussed around the world, and these discussions are echoed in the Norwegian school system as well. Schools and municipalities are encouraged to implement programs to improve the learning environment, but anecdotal evidence says that implementation vary across schools and municipalities. One hypothesis for the present paper is that gender peer effects are less conditional on special education resources in schools that make use of a broader set of instruments to deal with misbehavior. We are unable to investigate this hypothesis explicitly, but seek to provide indicative evidence by breaking the sample into municipalities that differ with respect to the propensity of having established accountability systems.

\* Corresponding author. Tel.: +47 91707889.

E-mail address: [jon.iversen@svt.ntnu.no](mailto:jon.iversen@svt.ntnu.no) (J.M.V. Iversen).

A credible research strategy requires solutions to at least two endogeneity problems; related to the peer group composition, and to the use of special education resources. We start out by linking our analysis to the existing empirical peer literature that highlights that the student body composition is a result of parental sorting into schools. To deal with this challenge, we follow the by now standard approach (see for instance Hoxby, 2000; Lavy and Schlosser, 2011; Black, Devereux and Salvanes, 2010 and for a refinement Bifulco, Fletcher and Ross, 2011), and exploit idiosyncratic variations in the gender composition across adjacent cohorts of students within schools. By estimating an equation with a measure of student performance as the dependent variable and the proportion of boys in the grade as the independent variable of main interest, while including school fixed effects, time-varying school inputs, and controlling for individual student and family characteristics, we find no significant gender peer effects for all students for the 2007–2009 time period.

The variation in special education resources within-grade-across-years reflects student and teacher idiosyncrasies in addition to the significant and substantial increase in the proportion of students that are deemed eligible to special education in the period 2007–2010 due to a “common shock”. We seek to get rid of the former component by cultivating the school-specific trend in the average proportion of eligible students in each school. This approach takes us a long way, but we do not claim that we get rid of all endogeneity problems. We discuss enrichments of this strategy in the result section.

Introducing the interaction between the gender composition and special education to the regression analyses, we find that negative gender peer effects on average are dampened by the use of special education, but that the dampening effects vary substantially across different types of municipalities.

The structure of the paper is as follows: Section 2 provides a short presentation of the relevant theoretical contributions together with the current empirical evidence related to negative spillovers in classrooms. Section 3 introduces Norwegian institutions and the data, and the empirical strategy is presented in Section 4. Section 5 presents results, and Section 6 offers concluding remarks.

## 2. Theoretical considerations and existing empirical evidence

Within the thin theoretical literature focusing on decision-making within schools, two contributions are particularly useful for the present study. The first is Arnott and Rowse (1987). Motivated by the findings reported in the two most outstanding empirical analyses of peer effects in the seventies (Summers and Wolfe, 1977; Henderson, Mieszkowski and Sauvageau, 1978), Arnott and Rowse discuss what allocation of students and resources over classrooms most efficiently achieves various educational objectives. In their model; a social planner maximizes students' welfare by being able to manipulate peers' average ability and allocate resources differently. Within this setting, the optimal allocation of students and educational expenditures over classrooms when peer group effects are present depends, among other things, on the strength and character of the peer group effect and the preferences of the planner. The Arnott and Rowse model is useful because it highlights that school decision-makers act on the student body composition, and that the resources and composition of classrooms are endogenous variables. Since the peer group is being characterized by average ability; the model is not directly applicable to the problem at hand. In a slightly more general model we could think of optimal resource allocation as being conditional on the student body composition, the latter being characterized either by ability level or, as in our case, on the gender composition.

We have already alluded to the other important contribution: Lazear (2001) introduces disruptive students by characterizing classroom education as a public good with congestion. When one student disrupts a class, learning is reduced for all the other students. Lazear

discusses at length how principals and school owners might act to reduce the consequences from having misbehaving students, but he does not explicitly address special education. However, applying his conceptualization, it is easily seen that allocation of special education resources to misbehaving students might increase effective teaching time and gain ordinary students through two different mechanisms: first, special education resources targeted to some students in class effectively reduces the group size, and second, special education potentially reduces the targeted students' misbehavior. Importantly, if school decision makers systematically allocate special education resources to misbehaving boys, the potential negative gender peer effects might be reduced or neutralized.

The main lesson to take home from these models is that school decision-makers might be able to manipulate the social interactions in class. We could still talk about causal peer effects, but not about unconditional causal peer effects. We are aware of no empirical studies that explicitly have addressed how the actions of school decision-makers might shape the peer effects. However, there are two groups of related studies. First, the few studies that investigate the effects of special education resources on student performance report diverging findings. Hanushek, Kain and Rivkin (2002) find that special education students do not harm the performance of ordinary students, and that ordinary students that are exposed to eligible students that are not learning disabled, emotionally disturbed or speech impaired will have higher achievement gains than other individuals. A study by Friesen, Hickey and Krauth (2010) suggests that there are negative spillovers from classmates with special needs (learning and behavioral difficulties) on academic performance.

Second, a substantial number of studies seek to estimate the magnitude of negative externalities associated with distinct subgroups of classmates (for instance, Figlio, 2007; Bonesrønning, 2008; Fletcher, 2010). Hoxby (2000) is the first study of gender peer effects we are aware of. Arguing that the attractiveness of this peer measure stems from its variation across adjacent cohorts within schools being credibly idiosyncratic, she finds that both male and female students perform better in classes that are more female. Closest to the present paper is Lavy and Schlosser (2011), who use Israeli data to find that an increase in the proportion of girls in the class improves both the boys' and the girls' academic achievements: a 20 percentage point increase in the proportion of female classmates increases test scores by approximately 4–5% of a standard deviation in the students' test score distributions. Moreover, they provide indicative evidence that the mechanism appears to be that a higher proportion of females in a class leads to a better learning environment. Students who have more female peers report a lower level of classroom violence and disruption and better relationships with other students and with teachers. In Israel, however, learning disabled students are taken out of the school and placed in special education schools. The authors do not provide information on the selection of these students, or the criteria for removing them from ordinary instruction.

If school actors systematically try to mitigate potentially negative peer effects by actions that are unobserved or ignored by the researcher, we should expect that studies using non-experimental data provide estimates of peer effects that are biased downward. (Note however, that if studies using non-experimental data are unable to do away with all self-selection among parents the bias might be in the opposite direction.) We are aware of no experimental studies of students associated with negative externalities, but experimental studies of ability peer effects tend to report larger peer effects than non-experimental studies of the same phenomenon. Epple and Romano (2011) provide an overview: while studies exploiting randomization in primary education (Duflo, Dupas and Kremer, 2011; Kang, 2007; Whitmore, 2005; Graham, 2008) find large peer achievement effects ranging from 0.20 to 0.60, studies using non-experimental data and fixed-effects methods generally lead to peer

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