



## The short-term effects of school consolidation on student achievement: Evidence of disruption?



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### ABSTRACT

We exploit variation stemming from school consolidations in Denmark from 2010 to 2011 to analyze the impact on student achievement as measured by test scores. For each student we observe enrollment and test scores prior to school consolidation and up to four years after. We find that the achievement of students in closing schools is adversely affected in the short run. Furthermore, students initially enrolled in small schools experience the most detrimental effects. The effects appear to weaken over time, suggesting that part of the effect is due to disruption.

### 1. Introduction

In recent years, policy makers all over the world have imposed structural changes on schools and students to improve student achievement that encompass large and small changes in the students' current learning environment and that range from major school consolidations to minor adjustments in the quantity or quality of inputs. In economics of education, school size, in addition to student-teacher ratio, class size, and teacher qualifications, is considered one of many inputs in the educational production function. A growing literature exists on the causal impact of each of these policy instruments on student achievement in the medium and long term, but not much is known about the magnitude of the potential short-term disruption effect on the students' learning environment while implementing the changes.

In this paper, we estimate the short-term effect of school consolidation by exploiting a recent wave of school consolidations in Denmark. Our findings suggest that school consolidation adversely affects student achievement. In addition, at least part of the effect seems to be caused by a short-term disruption effect, which could possibly justify compensatory policies.

In North America, Europe, and Scandinavia in particular, many policy makers are convinced that larger schools are less costly than

smaller schools due to economies of scale (e.g., Leithwood & Jantzi, 2009). Further, it is often argued that larger schools are better than smaller schools when it comes to teacher specialization, qualifications and course quality. As a result, school consolidations (school closings, expansions, and mergers) are spreading and primary school size trends upwards (Ares Abalde, 2014). There is not much hard evidence, however, to support the supposedly beneficial effects of school consolidation, even though the impact of school consolidation and the closely related issue of the impact of school size have been investigated (e.g., Berry & West, 2010, Brummet, 2014 and De Haan, Leuven, & Oosterbeek, 2016, Kuziemko, 2006). To our knowledge, there is no evidence on the effects across types of consolidations.

This paper examines the impact of school consolidation on individual student achievement by employing a difference-in-differences (DID) strategy on detailed, student-level data. Like a few other studies, we are able to follow the development in individual student test scores throughout a school consolidation. For each student, we follow yearly enrollment and test scores one year prior to consolidation and then up to four years after. The consolidations we consider were the result of local school reforms that took place in Denmark in 2010 and 2011. During these two years, 312 out of about 1500 schools were closed, expanded, or merged, leaving approximately 15% of all students

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affected by the consolidations. This led to an average increase in school size at the individual level that ranged from 70 students for schools that expanded to 230 students for schools that closed. For the remaining schools unaffected by the reforms, the average increase in school size was only about five students. School consolidations were not generally targeted at low-performing schools.<sup>1</sup> Hence, we are able to investigate heterogeneous effects that reflect more than just the effects for low-performing, ‘displaced’ students and better-performing, ‘receiving’ students.<sup>2</sup> This possibly improves the external validity of the estimates.

We find that individual student test scores declined with consolidation and that the negative overall effect of consolidation appears to be driven by school closings; test scores of students exposed to school closure decrease by 5.9% of a standard deviation (SD). Furthermore, comparing the two- and four-year achievement gains, the results indicate that the detrimental effect of consolidations seems to diminish over time. Finally, we interpret the short-term negative effects as evidence that a disruption cost exists but that the magnitude is not larger than could be compensated for by, for example, smaller class sizes or having teacher’s aides.

The remainder of this paper is structured as follows. First, Section II discusses why school consolidation may affect student achievement. Section III then presents the relevant educational institutions and Section IV describes the data and the consolidations. Next, Section V presents the empirical analysis as well as robustness checks. Finally, Section VI investigates disruption as a potential mechanism and Section VII concludes the paper.

## 2. Why should school consolidation matter for student achievement?

School consolidation primarily affects schools by increasing school size and saving school costs, which is often the purpose of the merger. School consolidation, however, could also potentially impact the composition of the peer group, which may be another motivation for consolidation. In addition, it is likely that consolidation represents a structural change that exerts psychological costs on the students and teachers and therefore potentially distorts the learning environment. From the perspective of the student, a school transition has been hypothesized to lead to two main effects.<sup>3</sup> First, a school transition causes a *disruption effect*, which is a short-term effect – although it could potentially have long-lasting repercussions. Second, a school transition typically causes a change in *school quality*, e.g., school size and peer composition, which would possibly result in longer-term effects.

Most previous studies on the effect of consolidations focus on school size and are based on data from the U.S. or the U.K. They generally expect larger schools to produce positive effects due to the increased specialization of teachers, a more heterogeneous teacher and student composition, and, based on economies of scale, improved opportunities for the school to recruit and attract high-quality teachers, in addition to better time allocation between teaching and administrative work; see, for instance, Garrett, Newman, and Elbourne (2004), Leithwood and Jantzi (2009) and Ares Abalde (2014). On the other hand, researchers also recognize the possibility that smaller schools constitute a more intimate and safer environment, which may give teachers and students a more positive perception of schooling and thereby better support the learning environment. Thus, there are financial, sociological, and psychological arguments as to why the size of a school might affect student

learning and achievement. To date, the empirical evidence on the signs of the effects is ambiguous. Leithwood and Jantzi’s (2009) survey, for example, arrives at two main conclusions. First, the empirical evidence generally favors small schools, both in terms of student test scores and social factors. Second, the more recent research indicates that cost-effectiveness and efficiency are not a justification for larger schools.

Recent attempts to identify the impact of school size based on quasi-experimental variation yield ambiguous results; this is clear from the recent review by Humlum and Smith (2015b). Schwartz, Stiefel, and Wiswall (2013) and Barrow, Claessens, and Schanzenbach (2015) are based on instrumental variable methods exploiting variation in distance between the student’s home and the closest small high school as an instrument for school choice. They report favorable effects of attending a small high school on various outcomes. Because these studies draw upon distance to school as an instrument, they only identify the effect of interest under the assumption that the effect of school size is homogeneous across distance. The instrument is invalid if there is a systematic relationship between the distance to a small school and the expected return from attending a small school. Abdulkadiroğlu, Hu, and Pathak (2013) also focus on the effects of attending a small high school but are able to use assignment lotteries to identify the causal effect. They find positive effects of small high school size on a range of outcomes, including course scores and college enrollment.

While the previous authors investigated high schools, Berry and West (2010), De Haan et al. (2016), Kuziemko (2006), Liu et al. (2010), and Humlum and Smith (2015a) study primary schools. Kuziemko (2006) uses variation stemming from aggregate school-grade data on school mergers, student background and outcomes, and implements an instrumental variable method. She finds that small schools are more favorable for student outcomes than large schools. Berry and West (2010) exploit variation in the timing of school consolidation across the U.S. and find that students educated in states with smaller schools obtain higher returns from education. On the other hand, Liu, Zhang, Luo, Rozelle, and Loyalka (2010) study mergers occurring in China in 2002 and use DID and propensity score matching methods to document the absence of effects on test scores. De Haan et al. (2016) consider a reform of the Dutch school system that implied a decrease in the number of schools and find positive effects on student test scores upon completion of primary school. Their empirical strategy compares the cohort completing primary education before the reform with the cohort enrolled and completing primary education after implementation of the reform. They investigate four potential mechanisms and conclude that the positive effect of consolidation is mainly driven by school size. A recent longitudinal panel study from Denmark supports the non-negative impacts of increasing school size on long-term outcomes such as educational outcomes and earnings. To arrive at this conclusion, Humlum and Smith (2015a) exploit registry data on the total population and school catchment areas in order to apply multiple estimators and instruments. Combining the evidence from different identification strategies, studies by De Haan et al. (2016) and Humlum and Smith (2015a) seem to suggest that larger schools (in countries where the average school size is small) do not harm students.

However, consolidation potentially affects students, teachers, and schools in other ways than through school size. Consolidation often leads to the relocation of students and changes in their learning environment. As such, the effects of consolidation can be expected to be similar to what happens as a result of voluntary school moves. Of course, voluntary school moves are different in nature, just as the magnitude and direction of the effects on student academic performance may differ substantially. School moves are generally viewed as being associated with disruption costs and changes in school quality, see e.g., Hanushek, Kain, and Rivkin (2004) and Behaghel et al. (2017). Disruption costs may play a particularly important role when moves occur due to consolidation, which inherently affects multiple students simultaneously.

Only a few of the above-mentioned studies, however, focus on the

<sup>1</sup> Nonetheless, consolidating schools, particularly closing schools, tend to have lower performance and less favorable student characteristics than nonconsolidating schools. We cannot rule out that the decisions of some policy makers may have been affected by school performance and we therefore try to address this issue in our analysis.

<sup>2</sup> We use the term ‘displaced students’ to describe students who were exposed to a school closing while students in expanding schools are labelled ‘receiving’ students.

<sup>3</sup> See e.g., Hanushek, Kain, and Rivkin (2004) and Behaghel, de Chaisemartin, and Gurgand (2017).

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