Journal of Urban Economics 94 (2016) 73–89

Contents lists available at ScienceDirect

Journal of Urban Economics

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

Does size matter? Educational attainment and cohort size

Rune Borgan Reiling[1,2]

Center for Economic Research, Norwegian University of Science and Technology, NO-7491 Trondheim, Norway & Nordic Institute for Studies in Innovation, Research and Education, NO-0653 Oslo, Norway

ARTICLE INFO

Article history:
Received 26 September 2013
Revised 19 May 2016
Available online 30 May 2016

Keywords:
School completion
Cohort size
Education resources

ABSTRACT

Motivated by education expenditure studies consistently finding that education expenditures per student decrease in cohort size, I investigate the relationship between cohort size and the probability of graduating from upper secondary education. If resources are important for student performance, education expenditure studies suggest that being part of a large cohort is a disadvantage. Using a 24-year panel of Norwegian municipalities, I find a small positive effect of cohort size on the probability of graduation, suggesting that being part of a large cohort is actually beneficial. These results are robust to several checks, including accounting for possible Tiebout sorting across school districts and using birth cohort size as an instrument for cohort size in an IV approach. While the analyses conducted in this paper are unable to shed light on whether reduced spending per student actually hurts student outcomes, they indicate that a potential adverse effect of cohort size, working through educational resources, is not strong enough to offset the beneficial effect of larger cohorts on student performance.

1. Introduction

It is well documented that undertaking more education provides private returns as well as public benefits; see e.g., Belfield and Levin (2007). In this setting, graduating from upper secondary education is important, both as a starting point for higher education and as a qualifier for work in a number of occupations. Paradoxically, in many developed countries a significant proportion of youth do not complete upper secondary education. Addressing this issue requires an understanding of the forces affecting the student's probability of completing upper secondary education.

One of the most debated issues in the economics of education is the relationship between educational resources and student performance. In part, this debate reflects the fact that allocation of educational resources is partly a response to student performance or to variables correlated with performance. Thus, estimating a causal effect of educational spending can be challenging. In an attempt to circumvent issues related to resource allocation, I estimate a reduced form effect of cohort size on the probability of graduating from upper secondary education. This approach may indirectly capture the impact of educational resources per student on student performance. The idea builds on several education expenditure studies finding a negative relationship between the proportion of youth in local communities and per-student educational spending.[1] If resources are important for student performance, these studies suggest that being part of a large cohort is a disadvantage.

Indeed, previous studies (see e.g., Babcock et al., 2012) find that a sudden increase in cohort size leads to worsened student performance.[2] If larger grade cohorts produce similar scarcities in

E-mail address: rune.borgan.reiling@nifu.no

[1] I am grateful for useful comments and suggestions from the editor, anonymous referees, Bjarne Strøm, Lars-Erik Borge, Torberg Falch, Hans Bonesrønning, Astrid Marie Jorde Sandsør, co-researchers on the project 'Governance, management and performance in the Norwegian educational system' and seminar participants at Norwegian University of Science and Technology, Nordic Institute for Studies in Innovation, Research and Education, and Statistics Norway. Data are provided by Statistics Norway and Norwegian Social Science Data Services (NSD). Financial support from the Norwegian Research Council under The Programme for Educational Research (Utdanning 2010) is gratefully acknowledged. I bear the full responsibility for the analyses and conclusions in this paper.

[2] The analysis in an earlier version of this paper was based on a misspecification of the regression model. Hence, the results in this version of the paper substantially differ from the ones presented at earlier occasions.

[1] See e.g., Borge and Rattsø (1995, 2007) and Reiling (2013) for Scandinavian countries and Poterba (1997, 1998), Ladd and Murray (2001), Harris et al. (2001) and Figlio and Fletcher (2012) for the US.

[2] By utilizing the variation in entering cohort size within school districts over time, Babcock et al. (2012) analyze whether fluctuations in cohort size predict cohort shrinkage via grade retention. Their findings indicate that an increase in kindergarten enrollment of 10 percent leads to a shrinkage of 0.5 percentage points in the size of a cohort between first and second grade in elementary school. In another related paper, Fertig et al. (2009) investigate how changes in demographic structure – measured by relative cohort size as well as cohort composition at the national level – affect performance of students born between 1966 and 1986 in Germany. Their findings, similar to Babcock et al. (2012), suggest that an increase in cohort size has a negative impact on the human capital accumulation of students in Germany. However, it is challenging to identify causal effects of demographic changes when effects of relative cohort size and labor market variables are measured at the national level, as in Fertig et al. (2009). This issue is further discussed below. In a related context, Bound and Turner (2007), Card and Lemieux (2001) and

http://dx.doi.org/10.1016/j.jue.2016.05.006
0094-1190/

resources as larger classes or schools, the negative cohort size effect in Babcock et al. (2012) backs the disadvantage hypothesis. However, it is not obvious that an increase in cohort size has a negative impact on student performance. For instance, Poterba (1997, p. 59) suggests that "because of economies of scale in education, it is possible to deliver the same education to a larger cohort with less than a proportionate expansion in educational resources". Furthermore, related studies of the relationship between student performance and class size are also inconclusive. While the majority of class size studies find a negative relationship between student performance and class size, the size of this relationship is inconsistent across studies (Chingos, 2013).[3] Some authors even report opposite results; see e.g., Denny and Oppedisano (2013) and Dobbelsteen et al. (2002). Taken together, this opens for the possibility that an increase in cohort size could have a zero – or even a positive – effect on graduation.

To identify the effects of cohort size on students' probability of graduating from upper secondary education, I exploit Norwegian register data on students graduating from lower secondary education in the period 1981–2004. The student data are matched with information on their parents, and include an identifier of the municipality in which the student attended lower secondary education at age 16. While counties, covering several municipalities, are responsible for upper secondary education, municipalities are responsible for compulsory education, including lower secondary. As recent literature points to the importance of early childhood education,[4] I focus on how municipality-level changes in cohort size over time affect the students' probability of graduating.

The empirical approach in this paper is similar in spirit to the approach in Babcock et al. (2012). Conditioning on a set of student, family and municipality background characteristics, I am able to control for differences between students across years and municipalities. By including municipality fixed effects, county-by-cohort fixed effects and, eventually, linear municipality trends, I account for a wide range of unobservable factors that may affect the relationship between graduation and cohort size. To address potential concerns that could lead to biases in the estimates, I perform several robustness and specification checks, including an IV approach accounting for possible sorting biases due to selective migration.

The findings in this paper suggest a small, positive relationship between cohort size and the probability of graduating from upper secondary education. The impact of a 10% increase in cohort size on the student's probability of graduating fluctuates between 0.1 and 0.54 percentage points depending on the specification. The small, positive cohort size effect holds for a number of robustness and specification checks. Hence, none of the estimation results in this paper suggest that being part of a large cohort is a disadvantage.

What are the implications of the positive cohort size effect? If the reduced form approach used in this paper actually captures the impact of educational resources per student, the positive cohort size effect suggests that a reduction in educational resources does not hurt student performance. However, as the reduced form argument is indirect in nature, this would be to overstate the implications of the findings. While I present estimation results suggesting that an increase in a given cohort size leads to a decrease in educational resources, I cannot rule out the possibility that there are other important mechanisms (unrelated to educational resources) behind the positive relationship between cohort size and student performance.

For instance, the positive cohort size effect may be interpreted as a peer group effect. Dobbelsteen et al. (2002) find that a positive class size effect could be explained by the fact that larger classes tend to have a larger number of students with similar IQs. Moreover, the cohort size effect could depend on teaching style and/or teacher characteristics, as argued by Denny and Oppedisano (2013) and Dieterle (2013). For instance, teachers could apply a more effective teaching style when group size increases, or more experienced, high-skilled teachers can systematically be assigned to larger cohorts. Similarly, Hoxby (2000) and Leuven et al. (2008), suggest that teachers may be unable to take advantage of the extra time they could devote per student when the group becomes smaller.

Hence, there may be beneficial effects of being part of large cohort that offset a potential adverse effect of reduced educational resources. While I am not able to disentangle the mechanisms underlying the positive cohort size effect, at least the findings presented in this paper suggest that being part of a large cohort does not induce a disadvantage for lower secondary students in Norway.

The remainder of the paper is organized as follows. Section 2 presents the institutional background and empirical strategy. Section 3 describes the data. Basic results follow in Section 4, while Section 5 presents robustness checks. Section 6 includes a discussion of the findings and Section 7 concludes.

2. Institutional background and empirical strategy

2.1. Institutional background

The Norwegian education system consists of ten years of compulsory education (divided between seven years of primary education and three years of lower secondary education) and three of four years in voluntary upper secondary education.[5] According to school law, students have to enroll in school in the year they turn 6 years old, and very few students are exempted from the rule.[6] Furthermore, while grade repetition is quite normal in several countries around the world (including the US), repetition is practically non-existent within the Norwegian compulsory school system. According to Strøm (2004), this is consistent with "the strong integration and equalizing policy that all students within a cohort should be treated equal, and be given education in their ordinary class".

In Norway, municipalities (local jurisdictions) are responsible for the provision of compulsory education.[7] Municipalities are

Saavedra (2012) focus on supply constraints and "cohort crowding" in educational institutions. They all find a negative association between cohort size and educational outcomes due to a mismatch between demand and supply of education.

[3] Of special interest for Norway are the class size papers of Bonesrønning (2003), Leuven et al. (2008) and Iversen and Bonesrønning (2011) using Norwegian data to identify the effect of class size on student performance. All three papers use the same discontinuity, induced by a maximum class-size rule, as an instrument for actual class size. While Bonesrønning (2003) finds a small, negative class size effect, Leuven et al. (2008) find no significant effect of class size on student achievement in Norway. Iversen and Bonesrønning (2011) find a class size effect for students with low educated parents and students from dissolved families. Hægeland et al. (2012) argue that education resource effects can be hard to identify from class size because of input substitution. Using an IV approach, exploiting variation in natural resource incomes across school districts, they find that educational resources have a positive impact on student performance.

[4] See for instance Cunha et al. (2006, 2010) and Cunha and Heckman (2010).

[5] Upper secondary education comprises all courses leading to qualifications above the lower secondary level and below the level of higher education. It refers to the grades 11-13 in the Norwegian educational system.

[6] Before 1997, the school entry age was 7 years, while the number of compulsory school years was nine years.

[7] The Norwegian public sector is divided in three tiers; the central government, the county government and the municipal government. The counties and municipalities constitute the local public sector. There are 428 municipalities and 19 county authorities (2015). The capital, Oslo, is formally a municipality, but in addition has the same tasks as the county authorities. The municipalities and the county authorities have the same administrative status, whereas central government has the overriding authority and supervision of municipal and county municipal administration. The main representative of the central government supervising local authorities is the County Governor.