

Is month of birth associated with school outcomes in Sweden?¹

Vitor Miranda
Population and Welfare Department
Statistics Sweden

Fredrik W. Andersson
Economic Statistics Department
Statistics Sweden

October 2019

Schooling laws typically mandate that children start compulsory education the calendar year in which they turn a given age. This entails that children born earlier in the year are older than their other classmates. This has been reported to translate into inequalities in educational attainment in some countries, as older students tend to outperform their younger classmates. This study investigates whether there is evidence of this process in the Swedish educational system. School grades in mathematics and physical education at the final year of compulsory school are analyzed using register data on the total population of students in 2013-2018. A stronger gradient is found in physical education than in mathematics. Moreover, the gradient is more pronounced among boys and native-born pupils than among girls and foreign-born pupils.

Introduction

Scholars have long investigated the association between the period of the year that a person is born and outcomes later in life. The epidemiological literature has emphasized that being born in the winter or summer months may have different consequences for infant mortality rates and even to health and mortality at adult ages. The social sciences literature has emphasized the association between the period of the year one is born and certain measures of status attainment, such as achievement within the educational system. The focus is not primarily on biological arguments, but on how certain institutions group individuals by birth year and its consequences. For instance, in countries where schooling laws mandate that all children start compulsory education the calendar year in which they turn a given age (usually six or seven), children born earlier in the year are older than their classmates born later in the year at any given grade. Many studies have concluded that the older students tend to achieve higher grades compared to their younger classmates (McPhillips & Jordan-Black 2009; Roberts & Fairclough 2012; Campbell 2013).

The present study contributes to this literature by investigating school grades among students in Sweden by month of birth regarding two subjects: mathematics and physical education. The first subject is included to represent an assessment of cognitive abilities whereas performance in the second subject is associated with motor skills. Using register data on the total population of students finishing primary school between 2013 and 2018, we show that grade differentials by birth season

¹ Abstract submitted to the European Population Conference in Padova, Italy on June 24-27, 2020. This is preliminary work, please do not quote or cite. The views and opinions expressed in the text belong solely to the authors and do not necessarily reflect the position of their employer or any other agency or organization.

vary by subject, sex and immigrant background. Older pupils have higher grades in physical education than their younger classmates do, while there is a much weaker gradient in mathematics. Likewise, the age gradient in physical education is more pronounced among boys than among girls and it is marked among native-born pupils but not so prominent among foreign-born pupils. Some potential explanations for those patterns are discussed further below.

Primary school in Sweden

The Swedish primary school system is composed of nine grades. It is compulsory and children should start in first grade in the autumn of the year they turn seven years old. This implies that students should turn age sixteen during the calendar year they complete primary school. In each subject, students are assigned grades A to F, with A-E as passing grades and F a failing grade. The subjects included are Swedish, Mathematics, Biology, History, Geography, Physics, Chemistry, English, Physical Education and Health, Handicrafts, Music, Visual arts, Technology, Civics, Religion and Home and consumer studies.

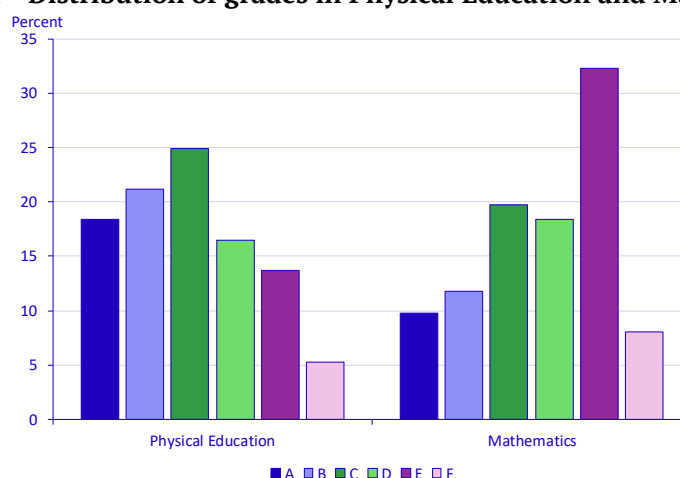
Data

The data used comes from the administrative registers maintained by the Swedish National Agency for Education and the Swedish national bureau of statistics (Statistics Sweden 2003). It includes all pupils that completed grade nine, the final year of primary school, in the springs of 2013 to 2018. Pupils that were not in age-appropriate grade (they might have repeated a grade, for instance) or that did not have information on grade (students with high absenteeism might not receive a grade) were excluded from the study. That exclusion adds to about 60 thousand cases, leaving the final study population at 550 thousand pupils. The variables used in the study are grade in each of the two subjects, month of birth, sex and immigrant background (native- or foreign-born). The study population is 46 percent native-born boys, 43 percent native-born girls, 6 percent foreign-born boys and 5 percent foreign-born girls.

Results

An overall picture of the distribution of grades in Physical Education and Mathematics is shown in Figure 1. Pupils performed better in Physical Education than in Mathematics. Eighteen percent of the students had grade A in physical education, whereas only 10 percent did so in mathematics. Receiving the lowest passing grade E was more common in Mathematics than in Physical Education, at 32 and 14 percent respectively.

Figure 1 - Distribution of grades in Physical Education and Mathematics



The proportion of pupils that got an A in each of the two subjects broken down by month of birth is shown in Figure 2. It shows that the relatively older children (i.e., those born in the beginning of the

year) were more likely to get an A in Physical Education than their relatively younger classmates. For example, 20 percent of the pupils born in January got an A in that subject compared to 15 percent of those born in December. The gradient is much smaller in Mathematics, however. The proportion of pupils that got an A oscillated around 10 percent among children born in different parts of the year, although there was a small gradient. It was about 1 percentage point higher among children born in January compared to those born in December.

One explanation for this pattern might be that relatively older children are physically stronger and have better motor skills. Those are relevant characteristics for evaluations in Physical Education. Mathematics, on the other hand, depends more heavily on cognitive skills, such as the ability to apply logical thinking. The age difference between the pupils might translate into a larger gap in motor skills than in cognitive skills, explaining the greater gradient in one subject than in the other. Nonetheless, it should also be kept in mind that getting an A in Mathematics is less common than in Physical Education. A difference of 1 percentage points between pupils born in January and December in that subject might be more relevant than a gradient of equal size in Physical Education.

Figure 2 – Percent of pupils with an A in Physical Ed. and Mathematics, by month of birth

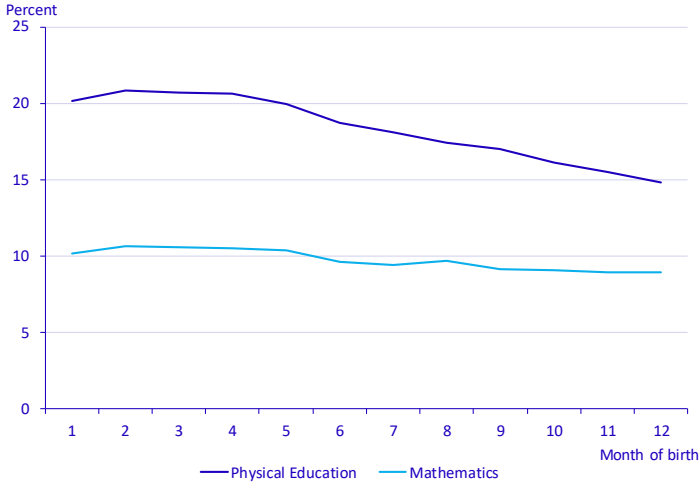
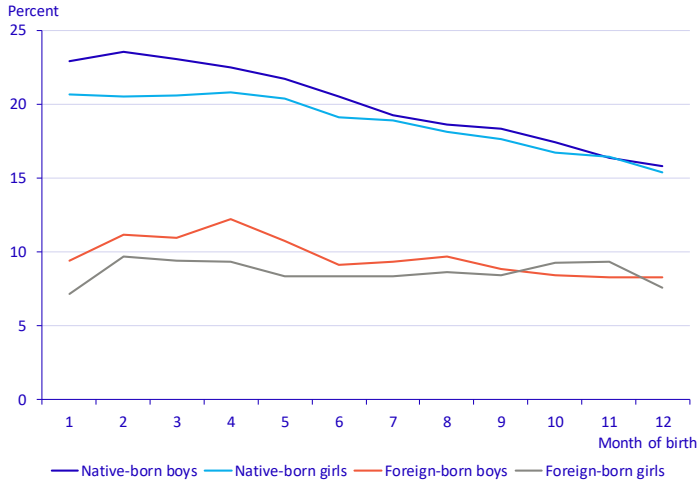


Figure 3 shows the proportion of pupils that got an A in Physical Education broken down by month of birth, sex and immigration background. It shows that the advantage of older pupils over their younger classmates is greater among native-born pupils. Among those, the gradient is stronger among boys than among girls. Grades are lower among foreign-born pupils and the gradient by month of birth is also weaker.

Figure 3 – Percent of pupils with an A in Physical Education, by month of birth, sex and immigration background



Further research on the topic is certainly in order for a better understanding of the mechanisms driving the general pattern shown in Figure 3. Nevertheless, a few preliminary speculations can be listed here which might help contextualize the results. One potential explanation for this difference by sex might be teacher bias in evaluating students. For instance, strength and motor skills might be characteristics that are more valued in boys than in girls. One possible explanation for the overall lower grades among foreign-born students might be that they participate in extracurricular activities, such as organized sports, to a lesser extent than native-born students do. In this case, the relatively older and stronger pupils might become less likely to stand out compared to the younger ones. A short period of residence in the country, difficulties regarding the Swedish language and teacher bias in evaluations may also play a role. Still, as stressed previously, those are solely tentative speculations and their relevance need to be assessed by further research.

References

- Campbell, T. (2013). "In-school ability grouping and the month of birth effect: Preliminary evidence from the Millenium Cohort Study". *CLS Cohort Studies*, Working Paper 2013/1. London: Centre for Longitudinal Studies.
- McPhillips, M., & Jordan-Black, J. A. (2009). "The effect of month of birth on the attainments of primary and secondary school pupils". *British Journal of Educational Psychology*, 79(3), 419-438.
- Roberts, S. J., & Fairclough, S. J. (2012). "The influence of relative age effect in the assessment of high school students in physical education in the United Kingdom". *Journal of teaching in physical education*, 31(1), 56-70.
- Statistics Sweden. (2003). *Access to microdata in the Nordic countries*. Örebro: Statistics Sweden.