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Single-sex schooling, gender and educational performance: Evidence using PISA data

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Synopsis

The advantages and disadvantages of single-sex schooling continues to be a source of policy and public debate. Previous empirical evidence is somewhat ambiguous with some studies finding a positive impact of single-sex schooling on education achievement and other outcomes while others finding no difference.

In this context, this study utilises the 2018 PISA data for Ireland to examine the relationship between single-sex education on mathematics, reading and science literacy performance for boys and girls respectively. We find significant raw gaps in reading, science and maths scores between females in single-sex and mixed-sex schools and in maths scores for males across the same school types.

However, after controlling for a rich set of individual, parental and school level factors we find that, on average, there is no significant difference in performance for girls or boys that attend single-sex schools compared to their mixed-schooling peers in science, maths or reading.

Introduction and Background

The topic of single-sex versus mixed-sex schooling continues to be a source of debate within education policy in many countries. If single-sex schools bring about better academic outcomes for students, such a policy would be a low-cost way in which to raise general educational attainment relative to other measures such as changes to class size or infrastructural investments. Previous empirical evidence is somewhat ambiguous with studies finding a positive impact of single-sex schooling on education achievement (Lee et al. 2014; Jackson 2002; Park et al., 2013) but some finding average null effects (Pahlke et al. 2014; Jackson, 2012).

To our knowledge, no studies have found that single-sex schools hinder students nor that mixed-sex schools have positive academic outcomes. Research in the area has tended to be concentrated on a small number of countries due to the fact that in most countries single-sex schools are selective and the numbers attending them are small (Doris et al. 2013; Halpern et al. 2011). Furthermore, many studies do many studies do not control for selection effects and student characteristics (Pahlke et al. 2014) and the heterogeneous effects of such policies is rare in existing studies (McCarey, 2017).

This suggests that more empirical evidence in the area is required to better understand this relationship. In Ireland, a high proportion of secondary school children (~1/3) attend a single-sex school. In addition, these schools are largely state-funded and non-selective,

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differing mainly in composition compared to mixed sex schools. For this reason, the Irish educational system provides an interesting setting for exploring the outcomes of single-sex schooling.

Methodology

The data used is from the 2018 Irish wave of the Programme for International Student Assessment (PISA) data that examines what students know in reading, mathematics and science, and what they can do with what they know (OECD, 2019). The assessment provides comparable information with regard to these outcomes for 15/16-year-old students by testing how well they apply their knowledge in everyday life situations. The Irish data has an achieved sample of 5,577 respondents from 157 different schools with both the school-level (100%) and student-level (87%) response rates above the OECD requirements (McKeown et al., 2019).

Using only those with relevant socioeconomic and school level information from this group leaves us with an estimation sample of 4,944 individuals. As well as these test results in reading, mathematics and science, the dataset also includes a rich set of information directly from questionnaires filled out by the students and school principals respectively. When considering the relationship between performance and single-sex schooling, selection bias is a key issue.

Thus, our models control for a range of observable socioeconomic and school level factors likely to be correlated with performance in PISA and attending a single-sex school. This allows us to run models such a standard linear regression that are technically robust and meet the criteria of the usual OECD studies.

Outcomes and Findings

From running a series of linear regression models with our different PISA outcome variables, we find that many of our observed characteristics are significantly associated with a higher score in math, reading or science. For example, higher levels of economics, social and cultural status, higher levels of parental engagement with school government activities and attending a non-disadvantaged school are associated with higher scores across each of the three tests. We also see that females perform significantly lower than males in maths but higher in reading, those born in Ireland or with a parent born in Ireland perform significantly better in reading compared to those not, while no statistically significant relationship is observed for our single sex dummy. We also estimate if there are significant differences in maths, reading or science both within gender and between gender by whether a student attends a single-sex school or not.

In other words, we test whether the difference in the predicted scores for those going to a single-sex school is different for those going to a coeducational school for boys and girls separately are significantly different from zero and are able to do the same for the predicted scores across gender but within schooling type.

These show that for boys, the significant raw advantage in maths performance in attending a single-sex school relative to boys in coeducational school goes away once we condition for socioeconomic and school level characteristics. Similarly, the raw advantage for girls attending single sex school goes away once we condition for observable characteristics. Therefore, conditional on our observed variables, these estimates show no evidence of an academic advantage to attending a single sex school for boys or girls.

Although these results suggest no difference in performance for maths, reading or science for those attending single-sex schools on average, it is important to examine further heterogeneity. Based upon the estimates of unconditional quantile regressions for the 20th, 40th, 60th and 80th percentiles of PISA maths performance, we also demonstrate the difference in maths and reading performance between those attending single-sex and coeducational schools for both males and females respectively across the performance distribution. Each of these models uses the same specification as the OLS results with the single–sex dummy variable interacted with gender.

While our distributional analysis indicates some level of heterogeneity in our relationship of interest, we find again no evidence of any statistically difference in maths or reading performance between those attending single-sex or coeducational schools once we condition for other factors.

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