

# EDUCATION

The Stanford Center on Poverty and Inequality

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## KEY FINDINGS

- There is considerable variation across highly developed countries in the extent to which students from high-income families have higher academic test scores than students from low-income families (the “income achievement gap”).
- The income achievement gap in the United States is quite large relative to the 19 other Organization for Economic Cooperation and Development (OECD) countries examined here.
- Countries with higher levels of poverty, inequality, and economic segregation (among schools) tend to have larger income achievement gaps.
- Countries with less differentiated education systems and more standardized curricula generally have smaller income achievement gaps.

The United States is an outlier on many measures of inequality. When compared to other well-off countries, it has unusually high levels of income inequality, unusually high levels of wealth inequality, and unusually high levels of poverty. The purpose of this article is, in part, to ask whether the “income achievement gap”—the test score gap between children from high- and low-income families—is also unusually high in the U.S. This gap is important because it reflects (a) the extent to which students experience different socioeconomic conditions in their early childhood and different schooling conditions once they reach school age, and (b) the extent to which these socioeconomic and schooling context differences lead to different educational outcomes (test scores, in this case). It may accordingly be understood as an early (albeit obviously imperfect) measure of the extent to which opportunities are unequal.

Although a main purpose of this article is simply to establish how the U.S. stacks up against its peer countries on this key measure of unequal opportunity, our follow-up objective is to cast some light on the sources of international differences in this measure. We examine, in particular, whether income inequality is an important source of the achievement gap. The evidence from the U.S. is at least suggestive of an “income inequality” effect: In the 1980s and 1990s, as income inequality in the U.S. grew sharply, so too did the academic achievement gap by family income. That family income

and family socioeconomic status (SES) are related to children’s academic achievement is not surprising; that this relationship grew so rapidly in the U.S. in the last several decades, however, is rather surprising. The U.S. trends suggest that some of this growth may have been the result of rising income inequality.

As one way of investigating the relationships between income inequality, school system characteristics, and the income achievement gap, we examine data from multiple countries with widely varying levels of income inequality and school institutional structures. We investigate the association between the size of a country’s income achievement gap and a host of characteristics, including its poverty and inequality levels, welfare policies, parental support policies, and national school system policies.

## The Income-Achievement Association in the U.S.

The income achievement gap in the U.S. grew by roughly 40 percent between cohorts of students born in the mid-1970s and those born in 2000 (although the gap appears to have then declined by 15 percent in the subsequent decade). During this same period, income inequality among families with children grew sharply in the U.S., which is why one instinctively turns to income inequality as a source of the trend.

However attractive the income inequality hypothesis may be, it does not seem

to be straightforwardly driving the U.S. income achievement gap. This is because the *type* of changes in U.S. income inequality do not match up well with the *type* of changes in the U.S. achievement gap: Income inequality grew in the 1970s and 1980s largely because of stagnation at the bottom of the income distribution among families with children, while the income achievement gap grew mostly as children from families in the top half of the income distribution pulled away from their lower-income peers.

Still, income inequality may drive income achievement gaps indirectly through other social policies and conditions, such as a weakening social safety net, inadequate support for parents and families, and increasing segregation of neighborhoods and schools by income. Evidence from the U.S. shows that the income achievement gap is very large when children enter kindergarten and does not widen much between kindergarten and grade 12. This suggests that broader social

conditions may play a larger role in the income achievement gap than do schools.

It is difficult to adjudicate among the many possible explanations for increasing income achievement gaps using information from only the U.S. Examining income achievement gaps in other developed countries with widely varying income inequality, social conditions, and welfare and educational policies sheds new light on growing achievement disparities.

**The Income-Achievement Association in Cross-National Comparison**

We compare the U.S. to the 19 other developed countries for which we could obtain information both on students’ academic achievement in either reading or math in elementary or secondary school and their household income.<sup>1</sup> For each country and study, we estimate the average difference in test scores between students at the 90th and 10th percentiles of the household income distribution within their respective country and cohort. Figure 1 shows the estimated reading achievement gaps, measured in terms of standard deviations, for each of the countries in our sample.

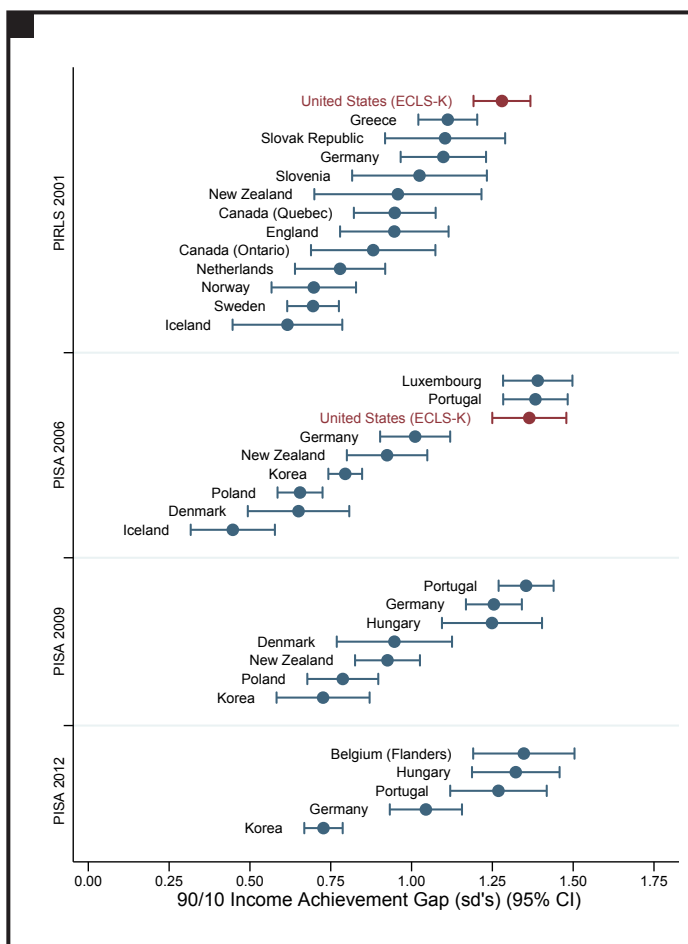
The evidence in Figure 1 is quite striking: The U.S. gaps for both elementary and secondary school rank among the largest across the available countries. Gaps in the U.S. are comparable in size to those of Portugal, Luxembourg, Hungary, and Belgium (Flanders). The countries with the smallest income achievement gaps are Iceland, Norway, Sweden, Poland, and Denmark.

The estimated gaps in elementary school appear somewhat smaller than those for secondary school, but this may be an artifact of our samples of countries for each study. There are very few overlapping countries across the elementary and secondary school studies; the only four countries in our sample for which we have data for both levels are Germany, Iceland, New Zealand, and the U.S. In our U.S. data, consistent with prior evidence from the U.S., the gaps are roughly the same size in elementary and secondary school. In the other three countries, we observe the same pattern. There is no evidence that gaps are markedly larger in secondary school than in elementary school. Thus, both U.S. and international evidence suggest that broader social conditions may play a larger role in the income achievement gap than do schools.

**The Effects of Inequality**

We turn next to the task of casting some light on the sources of this cross-national variation. We do so by examining the relationships between income achievement gaps and vari-

FIGURE 1. Estimated 90/10 Income Achievement Gaps in Reading, 2001–2012



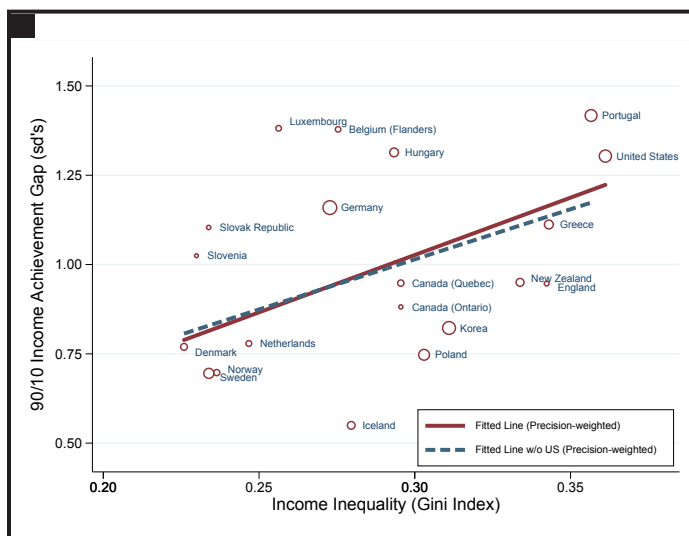
Note: Elementary school estimates are based on the Progress in International Reading Literacy Study (PIRLS) reading tests administered to 4th graders in 2001; secondary school estimates are based on the Programme for International Student Assessment (PISA) reading tests administered to 15-year-olds in 2006, 2009, or 2012.

ous country characteristics. It is natural to lead off, as we have in Figure 2, by examining the simple bivariate association between country-level income inequality and income achievement gaps.

In this and all subsequent figures, we pooled elementary and secondary school achievement gaps in all available subjects and averaged the country characteristics across years within each country. The size of each circle indicates the precision of each achievement gap estimate, with the larger circles indicating the most precisely estimated gaps. Each of Figures 2 to 6 includes two fitted lines. The solid red line is the precision-weighted regression line through the 20 data points. Because the U.S. has extreme values on some of the country characteristics and because the gap data for the U.S. come from a different data source, we also fit precision-weighted regression lines that exclude the U.S. This allows us to examine whether the fitted lines are heavily influenced by the presence of the U.S. in the sample. The estimates based on these regressions are shown as dashed blue lines in each figure.

We hypothesized that countries with higher income inequality would have larger income achievement gaps; Figure 2 shows a modest positive association between the two. Some of the countries with large income achievement gaps, notably the U.S. and Portugal, have very high levels of income inequality; others, such as Luxembourg and Belgium (Flanders), have moderately low levels of income inequality. Most of the countries with the smallest income achievement gaps are Scandinavian countries with low levels of income inequality. Poland, however, has both moderately high income inequality

FIGURE 2. Association Between Income Achievement Gap and Income Inequality, 2001–2012



and low income achievement gaps.

This evidence, like that pertaining to trends within the U.S., does not suggest a straightforward relationship between income inequality and income achievement gaps. But income inequality may drive gaps indirectly through other social conditions that are correlated with (or caused by) income inequality. In developed countries, income inequality is strongly correlated with child poverty rates (because a high poverty rate in a rich country implies substantial income inequality), as well as other sequelae of poverty and inequality, such as high rates of teen childbirth, high rates of low birthweight, and high levels of segregation by income among schools.

We examine each of these characteristics in turn and find that all are, as predicted, positively associated with income achievement gaps. Figures 3 and 4 present the results for the two strongest associations: the association with child poverty and that with income segregation (among schools). Both relationships remain strong (or grow stronger) when the U.S. is excluded from the sample, an important finding given that its child poverty and income segregation measures are very high relative to the other OECD countries.

Although the association of income segregation and the income achievement gap is strong, the mechanisms that produce this association are not obvious. Because residential and school segregation are correlated, it is not clear whether this association arises from school segregation (and inequalities in school quality associated with segregation) or residential segregation (and inequalities in environment and opportunities associated with residential segregation). The relationships between the rates of teen childbirth and low birthweight and income achievement gaps are positive but weaker.

### The Effects of Policy

The “direct approach” to reducing the size of the achievement gap is simply to reduce the amount of income inequality in a society. If indeed the gap is mainly a function of income inequality (and its sequelae), then a society could in principle opt to reduce the gap by reducing the amount of inequality. The rationale for doing so is that one cannot easily deliver equal opportunities to children when the resources available to their parents are so grossly different.

The alternative “indirect approach,” however, is to leave such inequalities intact but devise state policies that at least reduce their effects. There are two main candidate policies in this regard: social welfare policy and parental support policy. We expect that countries with strong social welfare policy can reduce the effects of income disparities by “decommodifying”

achievement-enhancing resources. That is, insofar as such resources are provided to all families regardless of income, then the *effects* of income on achievement will presumably be reduced (without reducing the amount of income inequality itself). We constructed an index of social welfare policy that included public health expenditures, public spending on family benefits in cash, public spending on family benefits in services, and pre-primary school enrollment rates.

We also constructed an index of parental support measuring (albeit crudely) the extent to which a country requires paid parental leave following the birth of a child. We would have preferred a more general measure of early childhood support pertaining to social policies that support families with young children and that provide educational opportunities for young children. We would of course expect a reduction in the size of the achievement gap when children from poorer families tend to have parents at home during infancy and have more educational opportunities prior to enrolling in primary school. However, the only policy measures we were able to obtain were measures of parental leave policy, hence we were obliged to construct our index using (a) the maximum number of weeks of leave for mothers, (b) the number of weeks of paternity leave for fathers, (c) the paid leave full-rate equivalent pay for mothers, and (d) the paid leave full-rate equivalent for fathers.

Both the social welfare policy index and the parental support index were, as expected, negatively associated with income achievement gaps, but the relationships are weak (results not shown here). We are not confident, however, that the social welfare policy and parental support indices were sufficiently

well-defined to capture the true relationship of social policies to income achievement gaps. The upshot is that, on the basis of the data available to us, the viability of a policy-based response remains very unclear.

**The Surgical Approach**

We conclude by examining a third and more “surgical” approach to reducing the size of the gap. If a country opts against both direct reductions in inequality, as well as against various types of “decommodifying” policies that reduce the effects of money, it may instead attempt to surgically intervene in the way in which education itself is delivered.

As such, we next examine the relationship between income achievement gaps and features of national educational systems. International research describing the institutional structures of educational systems often focuses on two key dimensions: differentiation and standardization. Differentiation, which pertains to whether students are placed in different curricular tracks on the basis of ability or prior achievement, may reproduce social class differences if lower-SES students are overwhelmingly assigned to lower tracks (either because of low prior performance or discrimination). Within lower tracks, educational expectations are lower, and curricula and instruction target less advanced academic skills, thus reducing achievement. In contrast, standardization of resources and curricula may produce greater homogeneity of educational quality across schools.

We created an index of differentiation measuring the extent to which the educational system is structured to provide highly differentiated learning environments for students. We

FIGURE 3. Association Between Income Achievement Gap and Child Poverty Rate, 2001–2012

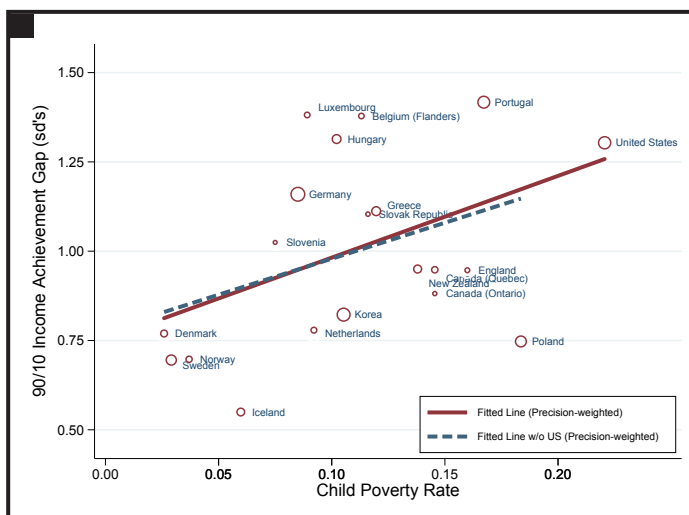
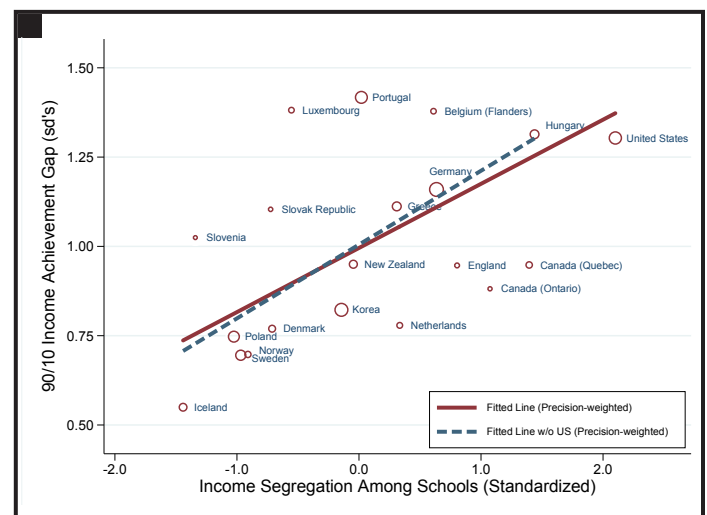


FIGURE 4. Association Between Income Achievement Gap and Income Segregation, 2001–2012



reason that a more differentiated system—one with high levels of tracking and a large private school sector—may lead to greater stratification of students both between and within schools. If this stratification is associated with family socio-economic background (as it generally is), more differentiation may contribute to widening academic achievement disparities. The index includes the proportion of students in private schools, the proportion of secondary school students in vocational tracks, the number of distinct tracks in secondary school, and the age at which students are first tracked (with lower ages implying greater differentiation). Figure 5 shows the relationship between this differentiation index and income achievement gaps. The relationship is strongly positive, as expected, and becomes even stronger when the U.S. is excluded.

To measure curricular standardization, we use a commonly-used proxy for standardization: the proportion of secondary school students required to take curriculum-based, high-stakes external exit exams. Such exams are typically created by a centralized educational authority and are used to determine whether students receive a secondary school diploma. Because they incentivize schools to focus on a common curriculum to which the tests are tied, they lead to standardized curricula. The measure ranges from 0 in countries with no centralized exams to 1 in countries where all students take centralized exams (and falls somewhere in between for countries with regional variation in exam policies). Figure 6 shows that, as predicted, the relationship between centralized exams and income achievement gaps is negative. It follows that there is also evidence—obviously only suggestive—for a more surgical approach to reducing the gap.

**Multivariate Analyses**

Many of the country characteristics examined above are strongly associated with one another. For example, countries with high income inequality also tend to have high levels of child poverty, high levels of school income segregation, and weaker social welfare and parental support policies. Countries with higher levels of school income segregation also tend to have lower levels of curricular standardization. The latter correlation may be generated through two possible causal pathways: in highly segregated places, people may demand more local control; or, conversely, in countries with more local control, families have more incentive to segregate by income.

A set of multivariate models (not shown here) predicting income achievement gaps as a function of our full set of national characteristics and educational policies indicate that the strongest independent predictors of gaps are school income segregation, educational differentiation, and curricular standardization.<sup>2</sup> These three factors together account for roughly 60 percent of the variance in the income achievement gap in our sample of 20 OECD countries. These results are consistent with a process in which (a) income inequality leads to wider income achievement disparities, largely through its effects on income segregation, and (b) the association between income and academic achievement is exacerbated by high levels of educational differentiation and low levels of curricular standardization.

If one were to take these results literally (and we of course caution against doing so), it would imply that there are various potential policy strategies for reducing the size of the income achievement gap. The direct approach of reducing

FIGURE 5. Association Between Income Achievement Gap and Differentiation Index, 2001–2012

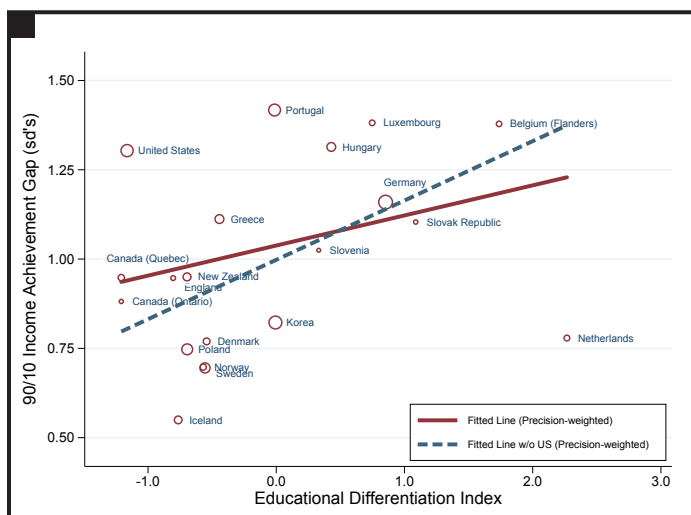
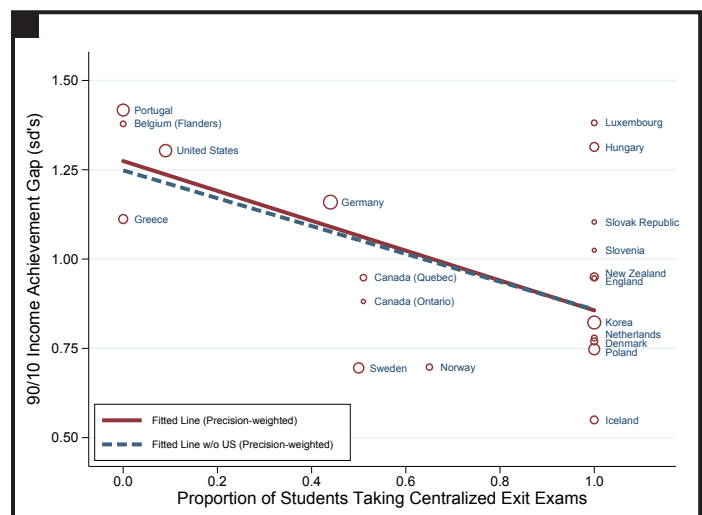


FIGURE 6. Association Between Income Achievement Gap and Curricular Standardization (Proportion Taking Centralized Exit Exams), 2001–2012



income inequality would suffice insofar as doing so leads to corollary reductions in school segregation. Alternatively, one might reduce segregation even while leaving the amount of income inequality intact, perhaps through zoning, housing, or school assignment and school choice policies. And, finally, there may also be payoff to “surgical” interventions in schools themselves, interventions that might focus on reducing educational differentiation and/or increasing curricular standardization.

### Conclusion

There is much variation among wealthy countries in the extent to which children from richer and poorer households do well on standardized tests. We can conclude that, just as various economic outcomes (e.g., income, wealth) are very unequally distributed in the U.S. (relative to the OECD norm), so too are opportunities for academic achievement very unequally distributed. We have also shown that the achievement gap is related to income inequality, segregation, and features of the educational system. If we wanted, in other words, to reduce the size of the achievement gap in the U.S., this evidence at least suggests that there are various ways to make that happen.

And there is indeed good reason to care about the achievement gap. Most importantly, cross-national differences in income achievement gaps may have implications for patterns of social mobility in different countries, although we did not test that possibility here. If school performance (as proxied by performance on standardized tests) is an important mechanism for upward mobility, then we might expect socioeconomic attainment (whether measured by educational attainment, occupational status, or income) to be more strongly correlated with parental income in countries with large income achievement gaps. Income achievement gaps might therefore be one mechanism underlying the association between economic inequality and social mobility documented in international research. ■

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### ADDITIONAL RESOURCES

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### NOTES

1. We define developed countries as OECD members with GDPs per capita of at least \$20,000 in 2012. For elementary school income achievement gaps, we use data from the 2001 Progress in International Reading Literacy Study (PIRLS), which tested fourth grade students in reading. For secondary school income achievement gaps, we use data from the 2006, 2009, and 2012 Programme for International Student Assessment (PISA)

studies, which tested 15-year-old students in reading, math, and science. Both the elementary and secondary school studies also collected annual household income before taxes from parent surveys. Because the U.S. did not participate in the parent surveys, we estimate its elementary and secondary school income achievement gaps using data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K). ECLS-K tested

a nationally-representative sample of U.S. third graders in reading and math in 2002 and again as eighth graders in 2007.

2. After controlling for other country characteristics, the relationship between income inequality and income achievement gaps is weak.