

Single-Parent Families and Student Achievement: An International Perspective*

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Single parenthood has been the issue of much debate in the United States. But how does the U.S. situation compare to other countries around the world? Using data from the international PISA student achievement test, this paper shows that the United States features about the highest incidence of single-parent families among the developed countries. And while in virtually all countries, the educational achievement of children raised in single parenthood trails those in dual-parent families, this achievement gap is also particularly pronounced in the United States. The fact that there have been substantial changes in achievement gaps by family structure in many countries since 2000 – both to the positive and to the negative – suggests that they are not destiny but may be susceptible to improvement even if the incidence of single parenthood persisted.

When Daniel Patrick Moynihan (1965) raised the issue of family structure half a century ago, it was in a race-specific context. Since then, the issue of single-parent families has been identified as a more general phenomenon affecting child outcomes in the United States (e.g., McLanahan (2009)). The substantial increase in the share of children raised in single-parent families in the United States is often viewed as a prime concern because the quality of parenting

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and nurturing environments is of major importance for the development of skills and ultimately for adult outcomes of children (Heckman (2006, 2008)).

This paper places the U.S. experience in a broader perspective. It provides an international comparison of the prevalence of single-parent families and how they relate to children's educational achievement. It documents the disparity in achievement between children from single- and dual-parent families across different countries. The focus on achievement measures is of particular interest as educational achievement is crucially important for the economic prosperity both of individuals (Hanushek et al. (2015)) and of society at large (Hanushek and Woessmann (2015)).

In particular, we address four descriptive questions: First, how does the share of youths living in single-parent families in the United States compare to other countries? Second, how does the achievement gap between children living in single- and dual-parent families compare to other countries? Third, to what extent does this achievement gap reflect other observed family differences such as socioeconomic status, parental education, or migrant background? And fourth, how have these associations changed since the beginning of the century?

Single parenting may affect child outcomes in a variety of ways. On the one hand, families with one rather than two parents tend to have lower resources, limiting their ability to invest in the child's development. Such factors may work in the same way as a reduction of resources within a dual-parent family would. On the other hand, single parenting may have independent effects beyond this by affecting the quality of parenting. Single parents may have less time to spend with their children, and partnership instability may subject them to psychological and emotional stress that worsens the nurturing environment for the child.

Empirically, the effect of family structure on child outcomes is a much-studied subject (e.g., McLanahan and Sandefur (1994); Lopoo and DeLeire (2014)). Disadvantages of children growing up in single-parent families in the United States have been documented for outcomes in youth and adolescence such as educational attainment and psychological distress – with limited evidence on cognitive achievement (e.g., Gennetian (2005)) – as well as outcomes in adulthood such as employment, income, and marital status. Disadvantages for children from single-parent families have also been documented in other countries, including Canada (e.g., Corak (2001)), Germany (e.g., Francesconi, Jenkins, and Siedler (2010)), Sweden (e.g., Björklund, Ginther, and Sundström (2007)), and the United Kingdom (e.g., Ermisch, Francesconi, and Pevalin (2004)). But not least because of differences in measuring family structure and child outcomes, cross-country evidence is hardly available in a comparable way.¹

Right at the outset, it should be emphasized that while the descriptive patterns documented here are relevant from a societal and political perspective, they do not necessarily capture a causal effect of living in single-parent families. Empirically, it is very hard to specify what the right counterfactual is for a child living in a single-parent family. In particular, getting divorced, ending cohabitation, and bearing a child outside a partnership are no exogenous events, but non-random decisions. Such choices are likely related to other factors important for child development, leading to potential selection bias in descriptive estimates. For example, severe stress that led to family breakup might well have continued without breakup and led to worse outcomes compared to families never threatened by breakup. If single-parent families differ from dual-parent families in unmeasured ways, omitted variable bias will lead to differences between the descriptive associations and any causal effect of family structure. It is even conceivable that

¹ A notable exception is the U.S.-Swedish comparison by Björklund, Ginther, and Sundström (2007).

problems of the children in school may have contributed to family breakup, giving rise to outright reverse causality.

To overcome some of the most obvious biases from confounding factors, we follow the majority of the literature by controlling for observed differences in other relevant features of family background – in our case, socioeconomic status as proxied by the number of books at home, parental education, and migrant and language background. Such models can inform about possible mechanisms that may have led to outcome differences by family structure. The literature that aims to identify causal effects of family structure is fairly limited and restricted to specific aspects.² Given the difficulty of the task, some of it may well fall short of causal identification. But it cautions that observed associations of child outcomes with family structure may well have other causes than family structure itself.

The Prevalence of Single-Parent Families

Our internationally comparative analysis uses the data from the most recent wave of the Programme for International Student Assessment (PISA), an internationally standardized

² For example, Gruber (2004) uses variation in divorce regulations across U.S. states and time to estimate the effect of unilateral divorce regimes. However, he cannot distinguish effects of actual increases in divorce rates from changing patterns of marriage formations, and the results do not necessarily inform about the effects of non-divorce forms of single parenthood. Others have used potentially exogenous variation in family structure due to the death of a parent (e.g., Corak (2001); Lang and Zagorsky (2001)), but families with a dying parent may differ in other unobserved ways and the loss of a parent by death may well have other own effects on child development than the mere change in family structure. Even other studies have applied sibling fixed effects to hold time-invariant aspects of families constant (e.g., Ermisch and Francesconi (2001); Björklund, Ginther, and Sundström (2007)), but family breakups may well coincide with other changes in family environments over time.

assessment administered every three years since 2000 by the Organisation for Economic Co-operation and Development (OECD). PISA tests the math, science, and reading achievement of representative samples of 15-year-old students in each participating country. It makes a concerted effort to obtain random samples of the school population and to monitor the testing conditions in each country, and results are only reported for countries whose conditions meet the standards. In 2012, a total of 65 countries and jurisdictions participated in the PISA test (see OECD (2013) for details). For comparability reasons, we restrict our analysis here to the 28 countries that were OECD members and PISA participants in 2000.

PISA collects a rich array of background information in student background questionnaires. Among others, students report whether a mother (including stepmother or foster mother) usually lives at home with them, and similarly for a father (including stepfather or foster father).³ We restrict our analysis to all students who live with either one or two parents.⁴ This

³ By including students living with stepparents, the group of students living in dual-parent families will also include some students who have experienced a family separation before, potentially biasing any difference between students from single- and dual-parent families towards zero. Evidence reported below for 2000, where the data allow us to separate out students living with stepparents, suggests that this is indeed the case.

⁴ That is, our sample does not include students living without any parent and students with missing information on either the father or the mother. On average across countries, 1.6 percent of students with non-missing data do not live with any parent (1.9 percent in the United States) and 7.4 percent of the total student population (10.5 percent in the United States) have missing data on whether mother and/or father lives at home with them (see Appendix Table A1). The share of missing observations on this question is particularly high in Germany (20.5 percent) and in Mexico (16.1 percent), raising concerns about the representativeness of the analysis sample. In Germany, this reflects that some states now require that a written consent by the parents is available on the day of testing for the students to fill out the background questionnaire. In both countries, as well as in the international

yields a total sample of over 230,000 students or about 8,500 students per country on average (see Appendix Table A1). The U.S. sample consists of over 4,300 students living in either single- or dual-parent families.

To describe the family structure in different countries, we use a simple dichotomy between single-parent families (student lives with either mother or father only) and dual-parent families (student lives with both mother and father). In the United States, 20.7 percent of 15-year-old students (who live in either single- or dual-parent families) live in single-parent families (Figure 1). Together with Hungary (20.8 percent), this puts the United States at the top of the countries. On average across the countries, the share of single-parent families is 13.7 percent. New Zealand also has a share higher than 20 percent, the Czech Republic 17.8 percent, and Poland, the United Kingdom, Finland, Mexico, Denmark, and France have shares between 15 and 17 percent. At the other end, Greece, Korea, Italy, and Sweden have shares between 8.8 and 9.6 percent and Spain, Iceland, Norway, Ireland, and the Netherlands have shares between 10 and 11.3 percent.

The vast majority of single-parent families are families with a single mother. Of the 13.7 percent single-parent families on average across countries, 86 percent or 11.8 percentage points are single motherhoods and only 1.9 percentage points single fatherhoods. In the United States, 84 percent or 17.4 percentage points of single-parent families are single motherhoods.

sample at large, students with missing information on family structure have lower test scores and fewer books at home.

Achievement Differences by Family Structure

PISA tests the educational achievement of students in math, science, and reading. In this paper, we focus on math achievement, which is generally viewed as being most readily comparable across countries. However, results for science and reading achievement (shown in Appendix Table A1) are quite similar in general. In each subject, achievement is measured on a scale that has a student-level standard deviation of 100 test-score points across OECD countries.⁵ That is, any achievement differences reported here can be interpreted as percentages of a standard deviation in test scores. To put this into perspective, one standard deviation in test-score performance is usually equivalent to between three and four years of learning on average. In line with this, the average difference in math achievement between the two grades with the largest shares of 15-year-olds in our sample (9th and 10th grade) is 28 test-score points, which could be interpreted as a rough measure of one grade-level equivalent in test scores.

In nearly all countries, students living in single-parent families have lower achievement on average than students living in dual-parent families (Figure 2).⁶ In the United States, the average achievement difference in math between students living in dual-parent families and students living in single-parent families is 26.6 points, or roughly one grade-level equivalent. As such, the United States belongs to the group of six countries with achievement differences larger than 25 points. Belgium has the largest disparity in math achievement by family structure at 35.1 points, followed by the Netherlands (29.1), Poland, Japan, and the United Kingdom (27-28). On

⁵ This scaling was done when a scale was first introduced, which was 2000 for reading, 2003 for math, and 2006 for science.

⁶ The achievement differences are estimated as the coefficient on living in a dual-parent family in least squares regressions weighted by students' sampling probabilities.

average across the 28 countries, students living in single-parent families perform 18.0 points worse than students living in dual-parent families.⁷

At the other end, Mexico does not show any achievement difference by family structure and the achievement difference is below 10 points in Portugal (5.6), Italy (6.6), Austria (8.0), and Germany (8.6). The differences in Mexico and Portugal are statistically not significant (and only at the 4.9 and 5.2 percent levels, respectively, in Austria and Germany). In all other countries, the differences are statistically highly significant.⁸

Figure 3 plots these achievement gaps by family structure against the countries' shares of students living in single-parent families. There is a slight tendency for countries with higher shares of single-parent families to have larger achievement disparities, although the correlation is not statistically significant.

The exceptional position of the United States in terms of single-parent families and its relatively large achievement gaps are clearly visible in this figure. Belgium and the Netherlands stand out as the two countries with the highest achievement disparities, although single parenthood is not exceptionally prevalent in these countries. On the other end, the Southern European countries (Greece, Italy, Portugal, and Spain) stand out as countries with relatively low achievement disparities and relatively low prevalence of single parenthood. The German-speaking countries (Austria, Germany, and Switzerland) show similarly low achievement disparities despite their higher prevalence of single parenthood. The Asian countries (Korea and

⁷ This difference is estimated in a model pooling all countries with country fixed effects.

⁸ In the United States, the achievement gap for single-mother families (25.1) hardly differs from the achievement gap of single-father families (23.7). However, in the international sample, the single-father gap (27.6) is substantially larger than the single-mother gap (15.5).

Japan) have lower levels of prevalence but higher achievement disparities. The Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) all have similarly middling levels of achievement disparities despite their different levels of single-parenthood incidence. The Eastern European countries (Czech Republic, Hungary, and Poland) have quite different achievement disparities despite their consistently high incidence of single parenthood.

When considering the figure in terms of the seriousness of each country's current situation as a social problem, it helps to consider the division of the figure into four quadrants. For countries in the top right cell that have high values on both variables – the United States being a leading example, but also such countries as the United Kingdom and Poland – single parenthood may constitute a major concern for the next generation. It is quite prevalent as a social phenomenon, and children in single-parent families fall substantially behind children in dual-parent families. In countries in the bottom right cell such as Hungary and Mexico, single parenthood is also highly prevalent, but the achievement disparity is less severe. On the other side, while single parenthood is less prevalent as a social phenomenon in the countries in the top left cell such as the Netherlands and Ireland, for the children raised in single parenthood this still constitutes a serious problem because of a large achievement difference to children in dual-parent families. Finally, while single parenthood exists and shows achievement disparities in the countries in the bottom left cell such as Italy and Spain, the situation may be less serious in terms of an overall social concern.

Accounting for Differences in other Background Factors

The achievement differences reported so far are raw differences, not conditioning on any other observable differences between students from single- and dual-parent families. To the extent that single parenthood tends to be associated with a generally disadvantaged background,

the reported achievement differences may (partly or totally) capture effects of disadvantaged backgrounds, as distinct from any independent effects of single parenthood through, for example, reduced quality of parenting. To provide a sense of the extent to which this might be the case, we next control for a set of measures meant to capture differences in family background beyond family structure.

In particular, we hold constant the number of books in the student's home (as a proxy for socioeconomic background), the highest education level of the parent(s), immigration status (native, first-, and second-generation immigrants), and whether the national language is spoken at home.⁹ All these measures are strongly associated with student achievement, and across countries books and parental education tend to be negatively associated with single parenthood. In the cross-sectional data, though, we cannot observe whether some of these aspects are preexisting characteristics of the families – in which case they would be confounding factors – or whether they are an outcome of single parenthood – in which case they would constitute mechanisms of the effect of interest.

Conditioning on the limited set of background factors has a substantial bearing on the estimated achievement disparity between students living in single- and dual-parent families (Figure 4). In the United States, the achievement disparity is reduced by over 60 percent from 26.6 to 10.4 points. Similarly, on average across all countries the disparity is reduced by more than half from 18.0 to 8.5 points. While the United States still features above-average achievement differences by family structure after conditioning, in absolute terms it differs less markedly from the international average. The countries with the largest conditional achievement gap by family background are Belgium (22.2), Poland (20.6), and the Netherlands (16.9). In

⁹ See Appendix Table A1 for details of the specification.

twelve countries, the conditional achievement gap is below 5 points, or less than half the conditional achievement gap in the United States. In fact, in seven countries the conditional achievement disparity by family structure is no longer statistically significant. In Korea (and marginally in Portugal), the conditional association even turns negative.

With the exception of Mexico and Switzerland – where conditioning on the background factors hardly affects the achievement difference by family structure – the conditional difference is smaller than the unconditional difference in all countries. In the majority of countries (19 out of 28), the reduction in the achievement disparity from conditioning on the observed factors is in the range of 40-80 percent of the unconditional achievement disparity.

The conditioning background factors do not contribute equally to the reduction in the achievement gap between students living in single- and dual-parent families. In fact, in the pooled sample of all countries, just conditioning on the number of books at home reduces the achievement difference by family structure to 9.1 points. By contrast, immigration status and language at home hardly contribute to the reduction. This pattern is quite similar in the United States. That is, in the international sample roughly half of the achievement difference between students living in single- and dual-parent families simply reflects differences in socioeconomic status as captured by the number of books in the home.

With the available data, it is impossible to differentiate whether the lack of books in single-parent homes mostly reflects a preexisting feature of the families or whether it is (at least partly) an outcome of the different family structure. In fact, the number of books at home may to some extent simply relate to the number of people living in the home. As this is less of a concern for the other three background measures, Figure 5 presents achievement differences between students living in single- and dual-parent families conditioning on parental education,

immigration status, and language spoken at home, but not on books at home. At 18.7 points, this conditional achievement gap in the United States lies roughly in the middle between the unconditional gap (26.6) and the gap that also conditions on books at home (10.4). On average across countries, the achievement gap in this model is 14.6 points. Thus, while some of the effect of conditioning on books at home may well capture part of the effect of family breakup, some of overall achievement gap also clearly reflects preexisting differences.

Of course, the set of four background factors considered here does by no means capture all relevant differences in family background. It is simply based on a choice of factors that have been found to be particularly relevant for student achievement in the existing literature. Thus, the reported conditional achievement gaps by family structure may well partly reflect further unobserved differences in other family background features rather than a genuine effect of family structure.

Changes in Patterns over Time

Finally, we analyze whether there are any trends in the observed patterns over time. To do so, we perform the same analyses for the first wave of PISA data, administered in 2000. Investigating changes over time is interesting for at least two reasons. First, they are interesting in their own right, to document how countries have changed both in terms of the prevalence of single-parent families and in the achievement gap between single- and dual-parent families. This also allows for an analysis of whether there are differences in the trends across countries. Second, observing within-country changes over time ignores level differences in cross-country comparisons. Thus, the observed association between two variables across countries – e.g., between prevalence of single parenthood and achievement gaps as above – when measured in changes over time will no longer be affected by cross-country differences in unobserved country

features such as cultural exposition to family separation or institutional support mechanisms as long as these do not change over time.

Over the twelve-year period 2000-2012, the share of 15-year-olds living in single-parent families has increased from 18.0 to 20.7 percent in the United States (see Appendix Table A2).¹⁰ This increase mirrors an increase from 11.5 to 13.7 percent on average in the international sample. However, while the share of students living in single-parent families has increased by more than five percentage points in some countries (Czech Republic 8.0, Poland 7.6, United Kingdom 6.8, Hungary 5.8, and Portugal 5.4), it has actually decreased by slightly more than three percentage points in three other countries (Italy, Sweden, and Australia).

Conceivably, the observed increase in single-parent families might have affected average student achievement. However, Figure 6, which plots the changes in the prevalence of single-parent families between 2000 and 2012 against changes in countries' average reading test scores over the same period,¹¹ shows that surprisingly, countries with larger increases in single-parent

¹⁰ In 2000, the question on who usually lives at home with the student had separate answer categories for “mother” and “other female guardian (e.g., stepmother or foster mother)”, which we combine into one category for comparability with the 2012 questionnaire (similarly for father). When analyzed separately, however, 8.7 percentage points (or 9.8 percent) of the 88.4 percent of students living in dual-parent families in the international sample live with at least one stepparent. These students in fact perform 9.0 points worse in math than students from single-parent families, whereas those students from dual-parent families whose parents do not include a stepparent perform 16.3 points better. Thus, the combined analyses for both 2000 and 2012 are likely biased downwards from students with disrupted family experiences contained in the dual-parent family category.

¹¹ We use reading rather than math achievement in the figures depicting changes since 2000 because only the reading test has been psychometrically scaled on a uniform scale since 2000. The math test was rescaled in 2003 to have the same OECD mean and standard deviation as in 2000 (with a common psychometric scale since), as was

families tend to have slightly more positive trends in reading achievement (correlation 0.352, significant at the 7 percent level). That is, increases in single parenthood do not seem to have contributed to disproportionate declines in average student achievement.

In 2000, the unconditional difference in math achievement between students from single- and dual-parent families was substantially higher in the United States at 37.4 points compared to 26.6 points in 2012 (Figure 7). Thus, over the course of twelve years, the achievement gap declined by 29 percent. Over the same period, the average achievement gap in the international sample increased by 33 percent from 13.6 to 18.0 points. In 2000, only the Netherlands at 42.5 points had a larger achievement gap than the United States. Korea (25.7) and Belgium (20.7) follow at some distance. At the other end, seven countries had achievement gaps lower than 5 points in 2000 (Iceland, Switzerland, Greece, Italy, Czech Republic, Ireland, and Mexico).

The pattern implies that the achievement gaps by family structure have followed different trends in the United States and the majority of other countries. While three other countries have also seen decreases in the achievement gap by more than 5 points (Netherlands 12.9, Finland 8.2, and Portugal 6.6), twelve countries have seen increases by more than 5 points, with the highest increases in Poland (24.4), Ireland (23.0), Greece (19.8), the Czech Republic (16.0), Japan (15.0), and Iceland (13.3).

Figure 8 plots these changes in achievement gaps by family structure against the changes in the prevalence of single parenthood over the same period, 2000-2012. Countries with larger increases in the incidence of single-parent families tend to have larger increases in the

the case for the science test in 2006. Still, the overall patterns are very similar across the three subjects (see Appendix Tables A1 and A2). However, the associations in Figures 6 and 8 do not reach statistical significance for math and science achievement.

achievement gap between students from single- and dual-parent families (correlation 0.354, significant at the 7 percent level). Changes in the prevalence of single parenthood may thus be related to changes in the achievement disparities by family structure.

As in 2012, in 2000 the achievement gaps between students from single- and dual-parent families are substantially reduced when differences in books at home, parental education, immigration status, and language spoken at home are controlled for (see Appendix Table A2). In the United States, the conditional achievement gap is 22.2 points (compared to the unconditional gap of 37.4 points), and in the international sample it is 6.9 points (compared to 13.6 points). The association of the change in the prevalence of single parenthood and the change in the achievement gap is even stronger when the latter is conditional (correlation 0.412, significant at the 3 percent level) rather than unconditional.

Conclusions

The descriptive patterns shown in this paper indicate that single parenthood is a prevalent issue in basically all OECD countries, but the share of single-parent families is particularly high in the United States. Likewise, students from single-parent families perform significantly lower than students from dual-parent families in virtually all countries. To a substantial part, though, this achievement gap reflects other background differences – in particular in terms of socioeconomic background as reflected in the number of books at home and parental education – rather than a genuine effect of family structure. The United States belongs to the group of countries with the largest achievement gaps by family structure, although this position of the United States was even more exceptional in 2000 than it is in 2012. In fact, while the achievement gap between students from single- and dual-parent families has declined in the United States, it has increased in the majority of other OECD countries.

This shows that achievement disparities by family structure are by no means destiny. Ample evidence reveals that it is possible to enhance adverse family environments to improve the quality of parenting, nurturing, and stimulation that promote child development (Heckman (2008)). It is an interesting direction for future research to identify specific child development activities that may have contributed to the differing trends documented here. More generally, future research should investigate to what extent factors such as differing welfare systems, child support facilities, divorce regulations, and other country characteristics may lie behind the documented differences in achievement gaps between students from single- and dual-parent families across countries and over time.

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Appendix Table A1: Students from Single-Parent Families and their Relative Achievement in PISA 2012

Country	Share single-parent families		Share living w/o parents		Unconditional achievement difference			Conditional achievement difference		
	Obs.	Missing			Math	Science	Reading	Math	Science	Reading
Australia	13.6	12,979	7.4	1.1	17.9*** (2.40)	16.8*** (2.50)	17.2*** (2.39)	4.2* (2.16)	2.3 (2.25)	3.3 (2.16)
Austria	13.6	4,419	6.4	0.6	8.0** (4.04)	8.6** (4.00)	5.8 (3.98)	6.6* (3.50)	7.3** (3.34)	2.4 (3.38)
Belgium	13.7	7,964	6.8	1.3	35.1*** (3.25)	34.1*** (3.17)	28.5*** (3.21)	22.2*** (2.83)	21.2*** (2.73)	16.3*** (2.79)
Canada	12.8	19,490	8.6	1.2	13.4*** (1.86)	11.5*** (1.90)	14.0*** (1.90)	4.9*** (1.72)	2.8 (1.74)	5.3*** (1.75)
Czech Republic	17.8	5,063	4.3	1.2	19.4*** (3.38)	9.8*** (3.23)	14.9*** (3.17)	6.6** (2.95)	-2.2 (2.81)	3.5 (2.79)
Denmark	15.2	6,935	5.1	1.4	22.5*** (2.68)	23.5*** (3.00)	19.6*** (2.76)	11.1*** (2.41)	10.8*** (2.70)	8.1*** (2.50)
Finland	16.1	8,035	7.9	0.6	21.8*** (2.51)	21.3*** (2.73)	12.5*** (2.77)	9.6*** (2.34)	8.6*** (2.55)	-0.3 (2.59)
France	15.2	4,197	8.1	1.2	23.5*** (4.12)	15.1*** (4.26)	14.6*** (4.61)	12.0*** (3.44)	2.8 (3.45)	2.8 (3.90)
Germany	13.7	3,951	20.5	0.8	8.6* (4.43)	7.9* (4.30)	4.0 (4.09)	3.3 (3.89)	2.5 (3.70)	-1.9 (3.55)
Greece	8.8	4,783	4.5	2.1	12.0*** (4.39)	13.5*** (4.45)	19.5*** (4.88)	9.4** (3.99)	10.8*** (4.08)	15.8*** (4.53)
Hungary	20.8	4,465	6.4	2.0	11.0*** (3.39)	10.6*** (3.24)	13.2*** (3.28)	2.4 (2.88)	2.9 (2.75)	5.5* (2.82)
Iceland	10.7	3,222	7.5	0.7	21.7*** (5.15)	24.5*** (5.59)	16.5*** (5.42)	11.4* (4.85)	12.9** (5.19)	6.7 (5.09)
Ireland	11.0	4,582	8.2	0.5	23.4*** (3.85)	27.3*** (4.18)	24.5*** (3.94)	8.1* (3.48)	10.7*** (3.74)	7.2** (3.46)
Italy	9.5	29,558	4.5	0.8	6.6*** (1.81)	5.5*** (1.82)	-0.6 (1.88)	3.9* (1.63)	2.6 (1.62)	-3.7** (1.67)
Japan	12.3	6,009	4.0	1.2	27.7*** (3.59)	29.3*** (3.65)	30.5*** (3.77)	8.5* (3.45)	12.2*** (3.53)	13.2*** (3.68)
Korea	8.9	4,580	7.3	1.8	12.9*** (4.98)	9.7** (4.14)	18.8*** (4.33)	-8.5* (4.66)	-6.1 (3.97)	1.9 (4.13)
Luxembourg	12.3	4,880	6.2	1.0	11.7*** (4.11)	10.7** (4.45)	8.1* (4.47)	2.6 (3.53)	1.6 (3.71)	-1.7 (3.78)
Mexico	15.7	26,870	16.1	6.4	0.0 (1.21)	-1.4 (1.15)	-5.2*** (1.29)	0.4 (1.14)	-1.0 (1.09)	-4.8*** (1.22)
Netherlands	11.3	4,204	4.5	0.7	29.1*** (4.35)	25.9*** (4.49)	19.9*** (4.42)	16.9*** (3.95)	12.8*** (4.00)	7.0* (3.94)
New Zealand	20.4	4,025	2.8	3.8	22.3*** (3.84)	17.8*** (3.98)	21.5*** (4.02)	8.4** (3.43)	3.6 (3.46)	8.0** (3.54)
Norway	10.8	4,304	7.4	0.9	15.6*** (4.37)	10.5** (4.73)	12.7*** (4.75)	2.2 (4.08)	-4.4 (4.37)	-2.6 (4.39)
Poland	16.9	4,335	1.4	4.7	27.9*** (3.55)	23.6*** (3.42)	27.3*** (3.40)	20.6*** (3.16)	16.6*** (3.08)	20.1*** (3.09)
Portugal	12.5	5,085	9.4	2.0	5.6 (3.89)	9.4** (3.66)	1.6 (3.82)	-0.2 (3.42)	3.5 (3.20)	-3.8 (3.40)
Spain	10.3	23,635	6.5	0.9	11.4*** (1.84)	7.2*** (1.79)	8.9*** (1.91)	4.3*** (1.61)	0.8 (1.59)	2.6 (1.71)
Sweden	9.6	4,257	9.0	1.3	20.4*** (4.60)	22.4*** (4.97)	15.7*** (5.33)	4.1 (4.14)	3.8 (4.39)	-3.9 (4.75)
Switzerland	13.6	10,486	5.5	0.7	10.5*** (2.64)	11.0*** (2.54)	1.2 (2.51)	10.6*** (2.32)	11.6*** (2.15)	0.4 (2.20)
United Kingdom	16.7	11,259	10.5	0.9	27.2*** (2.30)	26.2*** (2.41)	21.8*** (2.35)	12.3*** (2.03)	9.9*** (2.10)	6.2*** (2.05)
United States	20.7	4,382	10.5	1.9	26.6*** (3.29)	23.4*** (3.43)	25.3*** (3.34)	10.4*** (3.03)	7.5** (3.13)	9.3*** (3.09)
Average	13.7	237,954	7.4	1.6	18.0*** (0.54)	16.4*** (0.55)	15.0*** (0.55)	8.5*** (0.49)	6.6*** (0.49)	5.3*** (0.50)

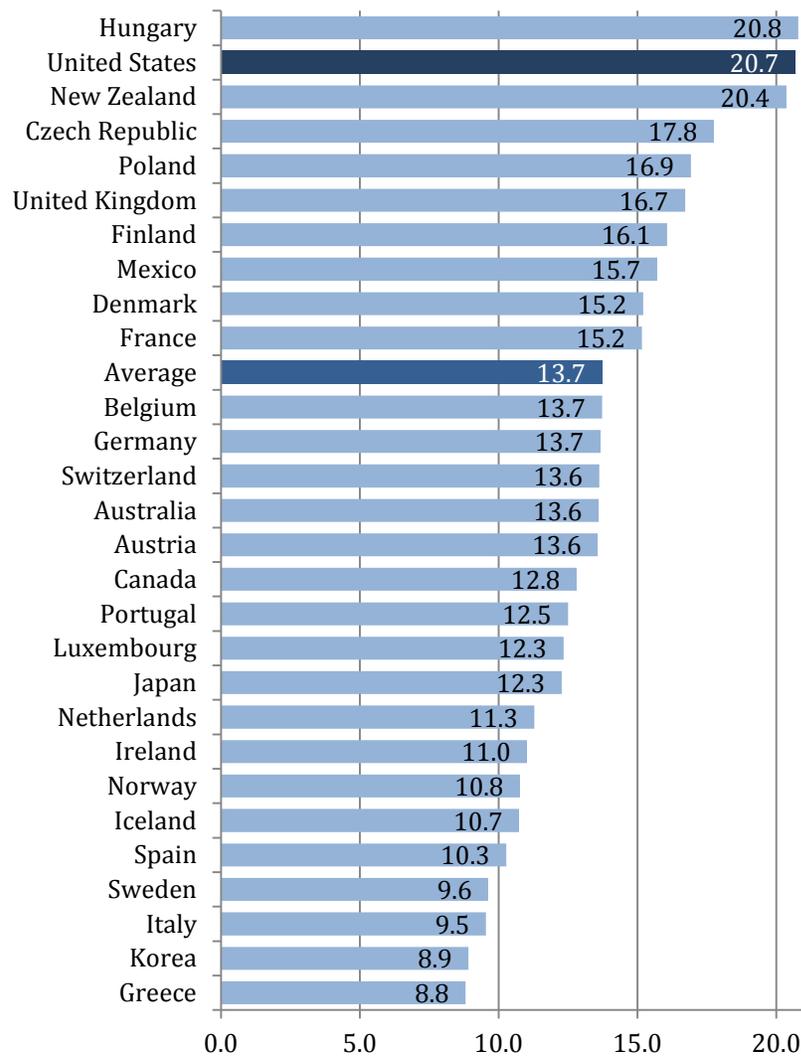
Notes: Share single-parent families: 15-year-old students living in single-parent families as a share of 15-year-old students living in single- and dual-parent families. Obs.: number of observations in our analysis (students living in single- or dual-parent families). Missing: students with missing data on family structure as a share of the total PISA sample. Share living w/o parents: students living with neither mother nor father as a share of non-missing observations. Achievement differences: coefficient on living in a dual-parent family in least squares regressions weighted by students' sampling probabilities, dependent variable: first plausible value of PISA achievement test score in respective subject. Unconditional: regressions include no additional controls. Conditional: regressions control for indicator variables for books at home (6 categories plus 3 forms of non-availability of data), highest education level of parent(s) (7+1), immigration status (3+1), and language spoken at home (2+3). Country fixed effects included in models pooling all countries. Standard errors in parentheses. Significance level: *** 1 percent, ** 5 percent, * 10 percent. Own calculations based on the PISA 2012 data.

Appendix Table A2: Students from Single-Parent Families and their Relative Achievement in PISA 2000

Country	Share single-parent families		Share living w/o parents		Unconditional achievement difference			Conditional achievement difference		
	Obs.	Missing			Math	Science	Reading	Math	Science	Reading
Australia	16.7	5,057	1.9	0.8	10.0** (4.54)	4.4 (4.73)	8.4** (3.83)	2.9 (4.23)	-4.6 (4.40)	-1.4 (3.54)
Austria	10.9	4,559	3.6	0.8	7.2 (5.91)	-1.3 (5.78)	-0.7 (4.37)	9.1* (5.33)	-1.8 (5.12)	-1.1 (3.82)
Belgium	11.0	6,436	3.9	0.5	20.7*** (5.48)	23.5*** (5.92)	24.1*** (4.24)	9.1* (4.67)	15.9*** (5.04)	12.0*** (3.60)
Canada	11.3	27,495	7.4	0.6	13.7*** (2.21)	7.9*** (2.22)	9.8*** (1.80)	8.3*** (2.12)	0.3 (2.11)	2.5 (1.69)
Czech Republic	9.8	5,216	2.9	0.6	3.6 (5.70)	8.9 (5.87)	-1.1 (4.41)	0.6 (4.99)	4.0 (5.03)	-6.1* (3.55)
Denmark	13.7	3,919	7.6	1.6	13.1** (5.27)	19.8*** (6.33)	12.9*** (4.47)	8.0* (4.76)	10.2* (5.69)	5.5 (3.96)
Finland	17.4	4,679	3.8	0.8	17.1*** (4.01)	18.6*** (4.43)	20.7*** (3.39)	11.2*** (3.85)	12.3*** (4.22)	14.6*** (3.22)
France	11.3	4,395	6.1	0.5	17.3*** (5.59)	9.6 (6.73)	17.9*** (4.31)	9.7* (5.13)	4.5 (5.86)	12.4*** (3.77)
Germany	14.8	4,978	2.0	0.6	12.6** (5.49)	5.3 (5.41)	5.2 (4.42)	9.0** (4.46)	4.6 (4.37)	0.5 (3.38)
Greece	3.9	4,291	7.9	0.8	2.0 (11.52)	-16.6* (9.66)	-0.3 (7.59)	2.8 (10.48)	-7.5 (8.94)	2.1 (6.96)
Hungary	15.0	4,618	5.6	1.7	7.6 (5.27)	7.8 (5.67)	5.5 (3.86)	0.2 (4.44)	-4.5 (4.75)	-4.1 (3.16)
Iceland	11.8	3,239	4.0	0.5	-3.9 (5.99)	-4.2 (6.44)	3.2 (4.97)	-13.1** (5.73)	-11.5* (6.22)	-6.4 (4.72)
Ireland	6.2	3,521	8.9	0.3	3.8 (7.43)	11.0 (8.58)	1.5 (6.46)	-5.6 (6.98)	6.9 (8.09)	-5.3 (6.09)
Italy	12.8	4,317	13.9	3.2	2.4 (5.45)	-7.2 (6.07)	-1.5 (4.09)	-0.8 (5.15)	-11.9** (5.50)	-5.8 (3.70)
Japan	10.8	4,950	6.9	0.8	18.7*** (5.31)	19.6*** (5.37)	15.5*** (3.87)	14.3*** (5.17)	16.4*** (5.17)	11.9*** (3.77)
Korea	5.4	4,759	4.2	0.8	25.7*** (7.35)	16.9** (6.90)	16.5*** (4.43)	21.3*** (6.86)	7.8 (6.59)	8.8** (4.19)
Luxembourg	9.5	3,362	4.8	0.6	5.4 (7.34)	3.6 (7.58)	9.0 (5.92)	5.8 (6.21)	2.8 (6.29)	8.3* (4.77)
Mexico	13.5	4,072	11.2	2.2	4.1 (5.13)	-10.6** (4.68)	-4.1 (3.94)	4.7 (4.48)	-10.4** (4.16)	-5.0 (3.39)
Netherlands	9.4	2,457	1.9	0.1	42.5*** (8.04)	25.7*** (9.08)	32.8*** (6.12)	18.9*** (7.24)	9.9 (8.12)	13.5** (5.53)
New Zealand	16.9	3,338	9.1	1.7	19.5*** (5.88)	12.6** (6.27)	22.0*** (4.87)	3.1 (5.36)	0.3 (5.54)	6.3 (4.31)
Norway	9.4	3,709	10.3	0.5	18.0*** (6.86)	10.1 (6.91)	15.8*** (5.69)	12.2* (6.46)	-1.9 (6.46)	5.5 (5.26)
Poland	9.3	3,547	2.7	0.3	18.8** (7.99)	6.4 (7.49)	2.9 (5.66)	14.3** (7.27)	-1.5 (6.86)	-4.3 (5.06)
Portugal	7.1	4,178	8.6	1.8	18.3** (7.16)	18.1** (7.09)	8.2 (5.86)	6.2 (6.60)	5.9 (6.53)	-3.1 (5.35)
Spain	10.9	5,486	12.0	2.0	9.1* (5.28)	12.8** (5.36)	8.5** (3.64)	1.6 (4.71)	-1.2 (4.85)	-0.4 (3.25)
Sweden	12.8	4,125	6.9	0.6	11.4** (5.59)	17.2*** (5.91)	16.1*** (4.21)	2.9 (5.28)	17.0*** (5.55)	9.6** (3.91)
Switzerland	11.2	5,813	4.2	0.5	1.4 (5.37)	-8.4 (5.69)	-7.1* (4.25)	3.5 (4.69)	-5.2 (4.82)	-4.7 (3.59)
United Kingdom	9.9	8,140	14.7	0.4	16.2*** (4.52)	18.5*** (4.80)	16.5*** (3.67)	7.0* (4.05)	6.5 (4.27)	5.6* (3.26)
United States	18.0	3,238	15.2	3.4	37.4*** (5.78)	37.9*** (6.09)	36.5*** (4.66)	22.2*** (5.16)	14.7*** (5.44)	16.6*** (4.14)
Average	11.5	147,894	6.9	1.0	13.6*** (1.00)	10.2*** (1.04)	11.3*** (0.78)	6.9*** (0.92)	3.5*** (0.94)	3.7*** (0.70)

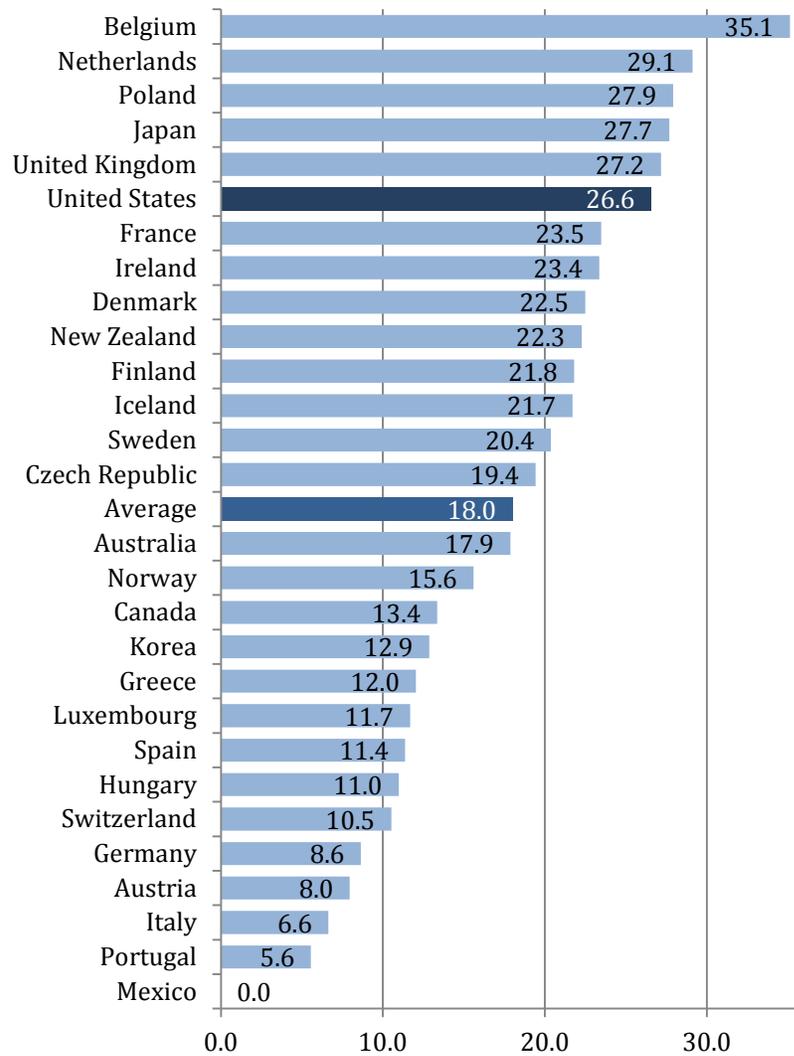
Notes: Share single-parent families: 15-year-old students living in single-parent families as a share of 15-year-old students living in single- and dual-parent families. Obs.: number of observations in our analysis (students living in single- or dual-parent families). Missing: students with missing data on family structure as a share of the total PISA sample. Share living w/o parents: students living with neither mother nor father as a share of non-missing observations. Achievement differences: coefficient on living in a dual-parent family in least squares regressions weighted by students' sampling probabilities, dependent variable: first plausible value of PISA achievement test score in respective subject. Unconditional: regressions include no additional controls. Conditional: regressions control for indicator variables for books at home (6 categories plus 3 forms of non-availability of data), highest education level of parent(s) (7+1), immigration status (3+1), and language spoken at home (2+3). Country fixed effects included in models pooling all countries. Standard errors in parentheses. Significance level: *** 1 percent, ** 5 percent, * 10 percent. Own calculations based on the PISA 2000 data.

Figure 1: The Prevalence of Single-Parent Families, 2012



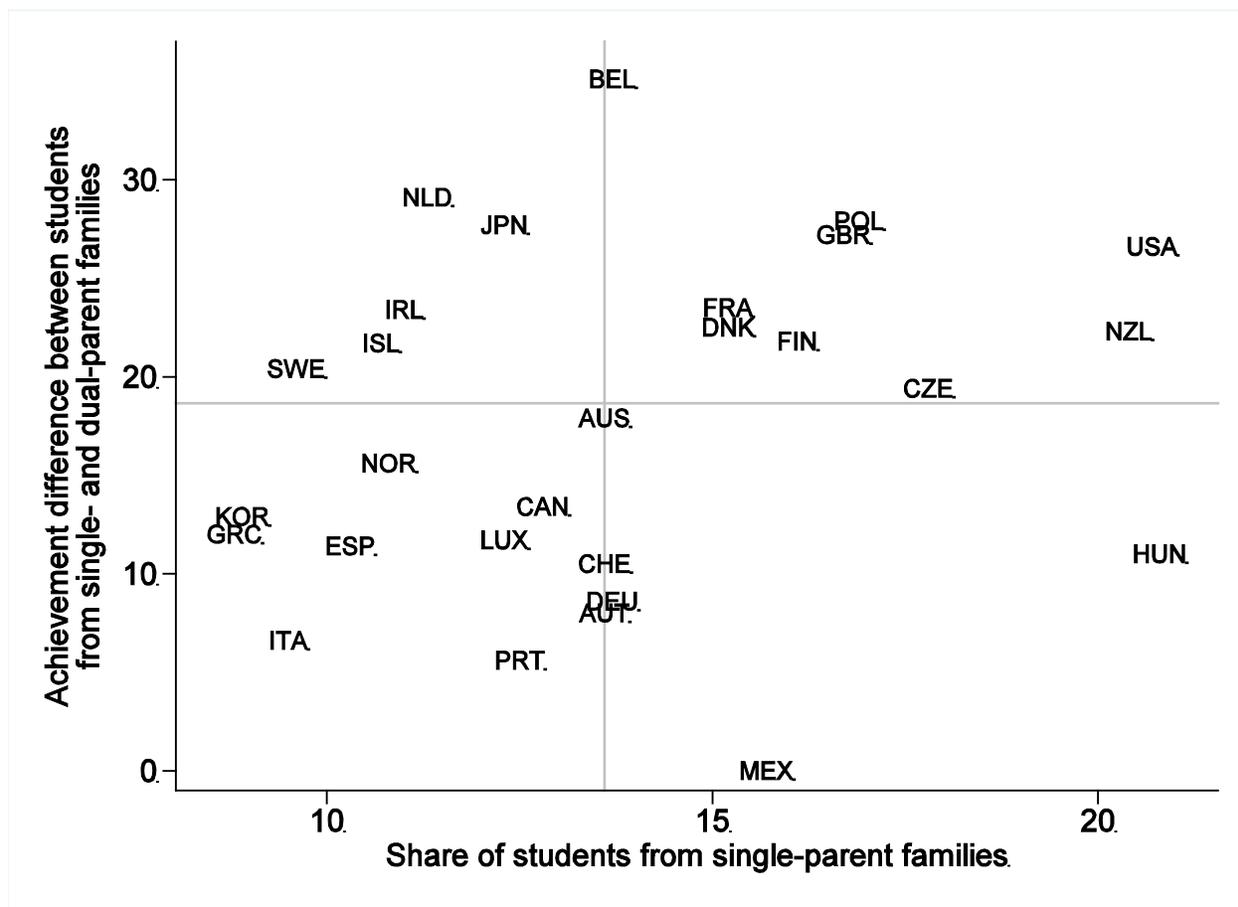
Notes: 15-year-old students living in single-parent families as a share of 15-year-old students living in single- and dual-parent families. Own calculations based on the PISA 2012 data.

Figure 2: Achievement Differences between Students from Single- and Dual-Parent Families, 2012



Notes: Difference in math achievement between students living in dual-parent families and students living in single-parent families. For statistical significance and specification details, see Appendix Table A1. Own calculations based on the PISA 2012 data.

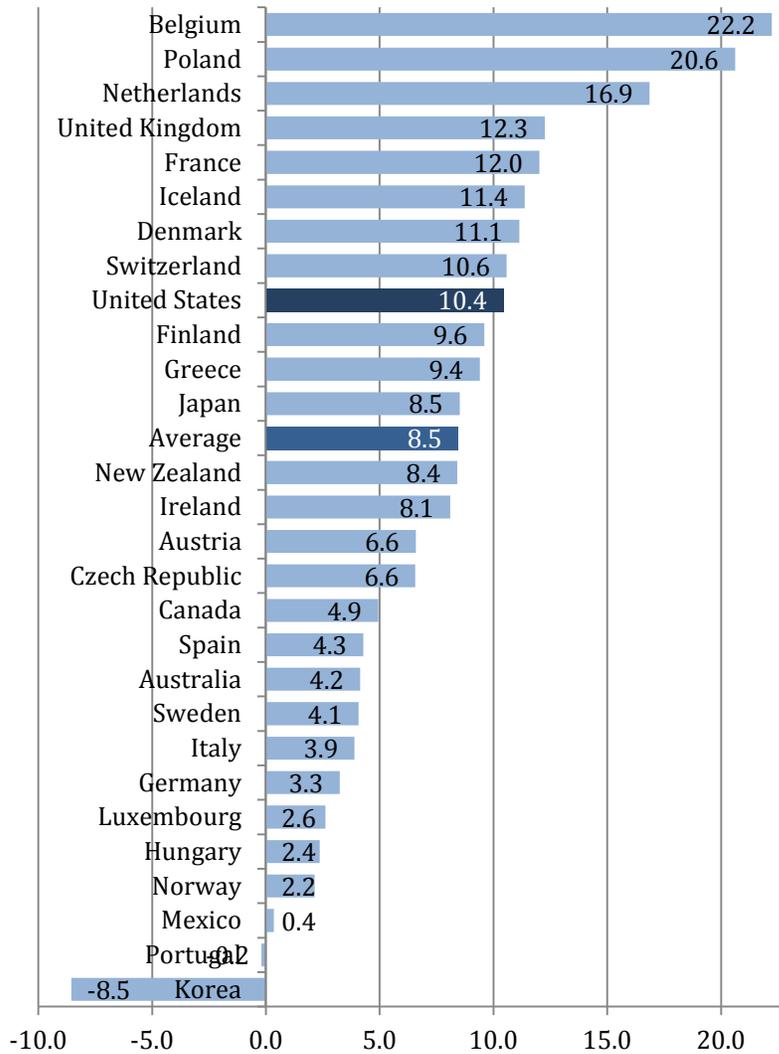
Figure 3: Share of Single-Parent Families and Achievement Gaps, 2012



Notes: Horizontal axis: Students living in single-parent families as a share of students living in single- and dual-parent families. Vertical axis: Difference in math achievement between students living in dual-parent families and students living in single-parent families. The gray lines indicate the international median of each variable. Own calculations based on the PISA 2012 data.

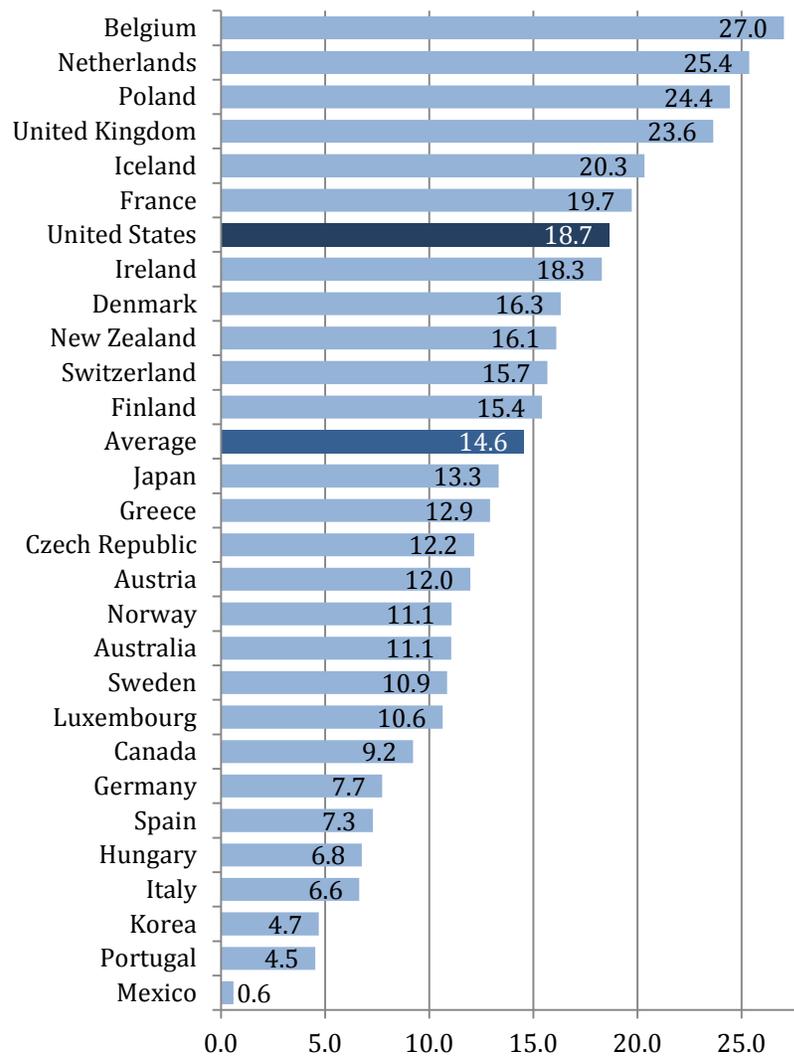
Country letter codes: AUS Australia, AUT Austria, BEL Belgium, CAN Canada, CHE Switzerland, CZE Czech Republic, DEU Germany, DNK Denmark, ESP Spain, FIN Finland, FRA France, GBR United Kingdom, GRC Greece, HUN Hungary, IRL Ireland, ISL Iceland, ITA Italy, JPN Japan, KOR Korea, LUX Luxembourg, MEX Mexico, NLD Netherlands, NOR Norway, NZL New Zealand, POL Poland, PRT Portugal, SWE Sweden, USA United States.

Figure 4: Achievement Differences between Students from Single- and Dual-Parent Families after Controlling for other Background Factors, 2012



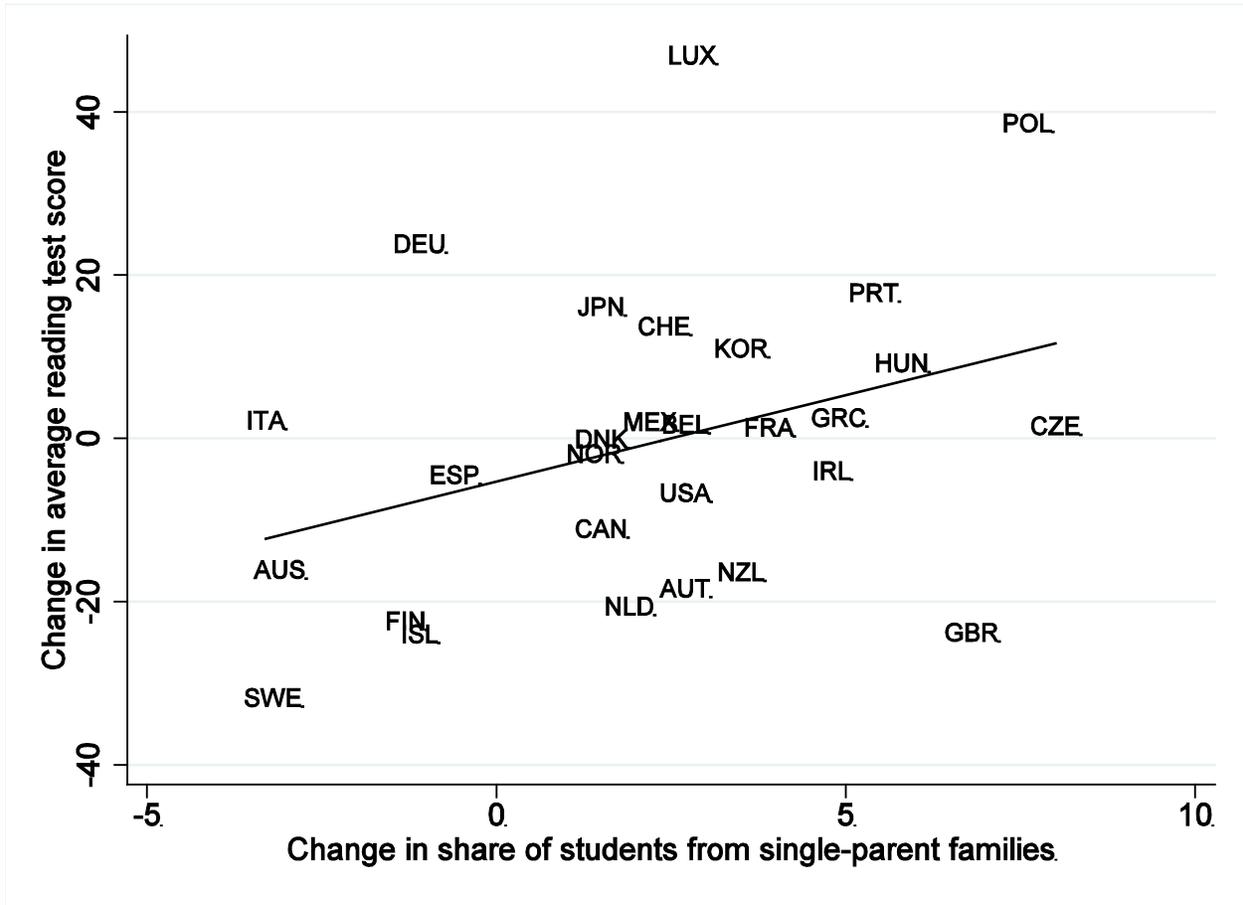
Notes: Difference in math achievement between students living in dual-parent families and students living in single-parent families after controlling for differences in books at home, parental education, immigration status, and language spoken at home. For statistical significance and specification details, see Appendix Table A1. Own calculations based on the PISA 2012 data.

Figure 5: Conditional Achievement Differences without Considering Books at Home, 2012



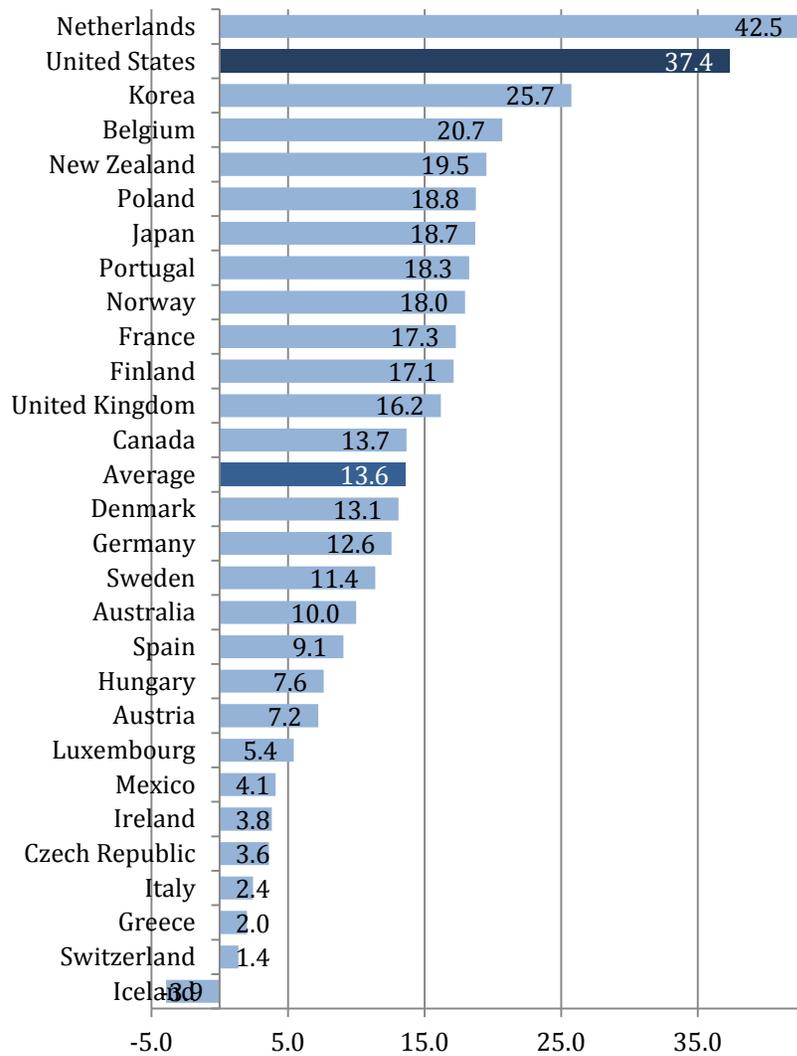
Notes: Difference in math achievement between students living in dual-parent families and students living in single-parent families after controlling for differences in parental education, immigration status, and language spoken at home. Own calculations based on the PISA 2012 data.

Figure 6: Change in Single-Parenthood Prevalence and in Achievement Levels, 2000-2012



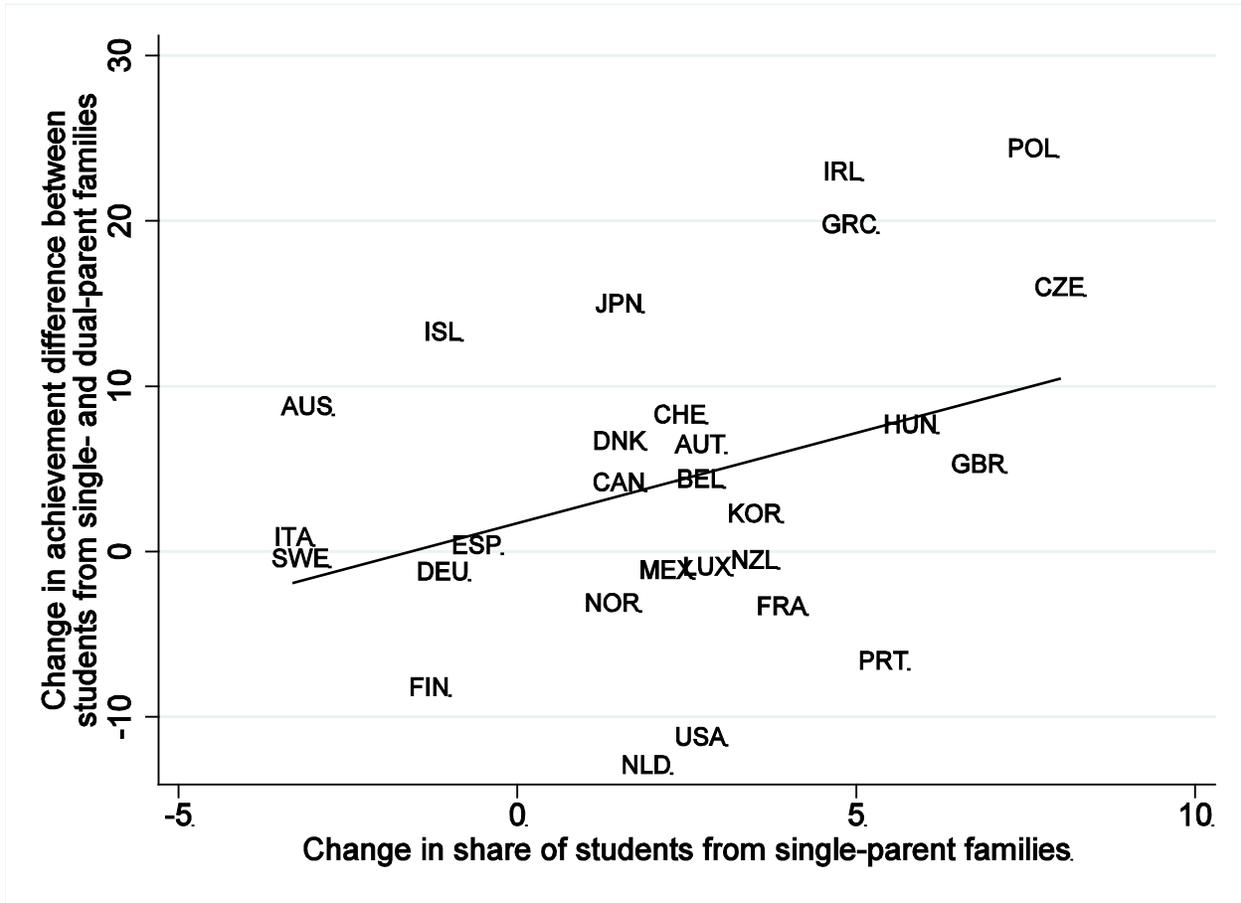
Notes: Horizontal axis: Change in the share of students living in single- and dual-parent families (as a share of students living in single- and dual-parent families) from 2000 to 2012. Vertical axis: Change in the average reading achievement test score from 2000 to 2012. See Figure 3 for country letter codes. Own calculations based on the PISA 2000 and 2012 data.

Figure 7: Achievement Differences between Students from Single- and Dual-Parent Families, 2000



Notes: Difference in math achievement between students living in dual-parent families and students living in single-parent families. For statistical significance and specification details, see Appendix Table A2. Own calculations based on the PISA 2000 data.

Figure 8: Change in Single-Parenthood Prevalence and in Achievement Gaps, 2000-2012



Notes: Horizontal axis: Change in the share of students living in single-parent families (as a share of students living in single- and dual-parent families) from 2000 to 2012. Vertical axis: Change in the difference in reading achievement between students living in dual-parent families and students living in single-parent families from 2000 to 2012. See Appendix Tables A1 and A2 for details. See Figure 3 for country letter codes. Own calculations based on the PISA 2000 and 2012 data.