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Lower Teaching and Learning Conditions?

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Mechanisms Behind the Negative Influence of Single Parenthood on School Performance: Lower Teaching and Learning Conditions?

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ABSTRACT

We take a first step toward unravelling the mechanisms behind the negative influence of single parenthood and the proportion of single-parent families on school performance, using 2012 international Program for International Student Assessment (PISA) data. We find that individual truancy of pupils fully explains the relationship between living in a single-mother family and math performance (after controlling for confounding factors, such as parental socioeconomic status). School-level measures of classroom disruption and truancy and individual truancy explain some of the negative effect of the school's concentration of students from single-parent families on individual students' math performance. However, the effect of a school's proportion of single-parent families remains significantly negative on individual performance.

KEYWORDS

Disruptive behavior; education; family structure; math performance; single-mother family; truancy

Research on the consequences of divorce on children's educational performance is restricted mainly to the family context. A few studies combine the family and school contexts. More specifically, these studies combine the family context and the effect of school-level concentration of single-parent families on the educational performance of children, whether or not the children are from single-parent families.

These studies, specifically in the United States (Pong, 1997, 1998), and in 25 Organization for Economic Co-operation and Development (OECD) countries, which includes the United States (De Lange, Dronkers, & Wolbers, 2014), find that being a child of a single parent and the proportion of single-parent families at a school negatively affect children's educational performance. Two explanations are given for this finding: a decline in the social network of the school community and a reduced amount of teaching and learning time at school and at home. However, the mechanisms behind these relationships have not yet been empirically tested.

This article examines the latter explanation using both truancy and classroom disruption as a measure of school teaching and learning conditions. Both these indicators reduce the effective learning time of students. The divorce of parents

could be related to disruptive behavior in schools and truancy of children due to reduced supervision by parents after divorce (Kearney, 2008; Wallerstein, Lewis, & Packer Rosenthal, 2013). We address the following questions:

(1) Does the family context of students from single-parent families affect truancy?
(2) Does the percentage of students from single-parent families at the school affect truancy?
(3) Does truancy and disruptive behavior explain the negative effect of the family context of students from single-parent families on educational performances?
(4) Do classroom disruptions, the mean truancy of the school, and individual truancy explain the negative effect of the school's composition of students from single-parent families on students' educational performance?

If we can answer all research questions in the positive, then the second explanation for the negative effect of the family context and school's composition of students from single-parent families on student educational performance is supported.

Theory

Family context

To our knowledge, studies on divorce and pupils in schools focus only on the influence of parental separation on school performance or the influence of divorce on student behavior. Studies that focus on divorce and school performance show that children of single-parent families have lower school performances than children from two-parent families (De Lange et al., 2014; Pong, Dronkers, & Hampden-Thompson, 2003). The literature on the behavior of children of divorced parents shows that they tend to have more emotional and other problems than other children (Amato & Cheadle, 2005). Emotional or other problem conduct influences behavior in school. For instance, Garriga (2010) found that children of single-parent families are more often late to school than are other children. Moreover, students engage in more truancy after divorce (Miller & Plant, 1999; Wallerstein et al., 2013. Absenteeism of children of divorced parents could be partly explained by less monitoring by the divorced parents (Kearney, 2008). Although Wallerstein et al. (2013) mentioned that truancy subsides when the mother resumes supervision and family life stabilizes in the years after divorce, a higher truancy rate for children of divorced parents remains compared to children who live in two-parent families (Miller & Plant, 1999). Consequently, we expect higher truancy rates for single-parent children. Because truancy also

decreases learning opportunities, we expect that truancy partly explains the relationship between family context and school performance. Moreover, students of single-parent families could behave more disruptively during lessons, because they are less accustomed to adult supervision (Kearney, 2008; Wallerstein et al., 2013) or because of individual emotional problems (Amato & Cheadle, 2005).

In our hypotheses about the family context, we assume that the educational performance of children in single-parent families is less affected by the possible instability of a single-parent family if the parent manages to maintain effective supervision. We set forth two hypotheses on the family context:

H1: Children living in single-parent families have higher levels of individual truancy and disruptive behavior and lower educational performance than children in two-parent families.

H2: The individual level of truancy and disruptive behavior partly explains the relation between living in a single-parent family and educational performance.

School context

Previous research shows that student type is one of the most important factors influencing student achievement. Parental influence on children often extends beyond the home to reach the communities in which the family lives and to the school communities to which the family is connected. Single mothers frequently spend their time working and on child care and have less time to work on relationships (Wallerstein et al., 2013). Due to the concentration on work and child care, less time is available to volunteer in school. Therefore, schools with a high concentration of children from single-parent families are usually characterized by lower socioeconomic status and by less social capital (Coleman, 1998), represented by a lower level of parental social relations and networks with other parents. Such contextual influence affects all children, not only those from disadvantaged or single-parent homes (Coleman, 1998). All children attending schools with a high concentration of single-parent families tend to perform less well than children in schools with low concentrations of single-parent families (De Lange et al., 2014; Pong, 1997, 1998). Therefore, the social capital explanation is mentioned as a mechanism to explain the negative relationship between the concentration of single-parent families and school performance (Pong, 1997, 1998).

In addition to this parental network explanation for the negative contextual effect of single parenthood on children's educational performance, Dronkers (2010) emphasized the more difficult teaching and learning conditions in schools with a high proportion of students from single-parent families. Educational

effectiveness depends on the amount of time available for both teaching and learning, which can be greatly diminished in schools where children have problems inside or outside the home that interrupt the teaching and learning process or because of truancy. If there are more students in a class with such problems, more learning and teaching time is consumed pursuing nonacademic goals. A higher percentage of pupils from single-parent families in a school might thus lead to more individual truancy, tardiness, and disturbed teaching and learning. Disruptive behavior at the school level is influenced by peer-group mechanisms (Veerman, 2015) and affects individual student performance (Arum & Velez, 2012; Ning, Van Damme, Van Den Noortgate, Yang, & Gielen, 2015). Insufficient teaching and learning time could prevent students from achieving a certain level of educational performance. Conversely, students in a classroom with few peers from single-parent families might enjoy more and uninterrupted teaching and learning time, and are more likely to perform better, given identical class schedules.

In two additional hypotheses on the classroom context set forth here, we assume that the relation between schools' percentage of children living in single-parent families and educational performance is caused by lower learning and teaching effectiveness in schools with high percentages of single-parent families and high levels of classroom disturbance. We present two hypotheses on this school context:

H3: There is a positive relation between the percentage of children living in single-parent families and individual truancy and individual disruptive behavior.

H4: The negative relationship between a school's percentage of children living in single-parent families and school performance can be explained partly by a combination of classroom and individual levels of disruption and classroom and individual truancy levels.

Project

Suet-Ling Pong was the first scholar to highlight the importance of looking beyond the individual level of single parenthood to the school-level influence of the proportion of single parents on school performance (Pong, 1997, 1998). Together with Jaap Dronkers, Pong earlier published a study (Pong et al., 2003) exploring the relationship between divorce and school performance. Dronkers initiated the European Network for the Sociological and Demographic Study of Divorce to bring together scholars in divorce studies to study and discuss the influence of divorce. Gert-Jan Veerman was a teacher for more than 10 years and observed how children of divorced parents sometimes showed school underperformance. The aim of this article is to understand whether student behavior can explain the relationship between single-mother families, the proportion of

single-parent families in a given school, and school performance. Dronkers, Veerman, and Pong developed the conceptual plan for this article. Dronkers wrote the drafts and Veerman and Pong edited the text. Dronkers helped Veerman with data analysis. Unfortunately, Pong passed away halfway through the project and Dronkers at the end of the project.

Data and variables

Data

We use data from the 2012 Program for International Student Assessment (PISA). The PISA data set contains the information from a survey that aims to evaluate education systems worldwide. The data collection is coordinated by the OECD. The cross-national PISA data set contains information on social economic background, classroom behavior, and standardized test scores of 15-year-old students from OECD and other developed countries (OECD, 2013). We focus on 28 Western countries and examine information on 233,467 students. The countries are Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, the United Kingdom, Greece, Hungary, Ireland, Iceland, Italy, Luxembourg, Netherlands, Norway, New Zealand, Poland, Portugal, the Slovak Republic, Slovenia, Sweden, and the United States. We omit 3.4 % of the 233,467 students because they have fewer than eight school peers who provided valid answers for the questions on classroom disorder or truancy. Furthermore, we omit 1.6 % of our sample due to missing information on the home situation, and another 1.4% due to missing data on other independent variables. We analyze only students who live in two-parent families or single-mother families and exclude all other family forms. These other family forms are rare in most countries in our sample, and including them would lead to biased results due to the low numbers of these family forms and due to the different meanings in different contexts of these family forms. To further reduce potential bias we also exclude migrant pupils whose families might be in transition from their origin country to the host country, because single-parenthood could have a different meaning for them (Dronkers & Kalmijn, 2013). Our working sample thus contains data on 173,669 students in 8,196 schools in 28 countries.

Variables

Dependent variable

The dependent variable in this study is students' performance on the math test developed by PISA. We prefer math performance because the questionnaire of PISA 2012 on student behavior refers mainly to the math lessons. The math scores are standardized for the OECD countries using an average of 500 and a standard deviation of 100. To reduce testing time, PISA created

five different booklets containing a number of very similar test questions. Each student could receive a different booklet. Because such differing tests can never offer exactly the same degree of difficulty, item response modeling is used to achieve comparable results between students. We use all five plausible values in the computation of each of our regression models. For every model we ran our regressions five times, each on one plausible value. We then averaged the parameter estimates and took into account the between- and within-regression standard errors.

Independent variables indicating teaching and learning conditions

Three major independent variables were constructed to measure the condition of teaching and learning. The first is *truancy* for each individual student. Students were asked if, in the last 2 weeks, they "arrive late for school," "skip a whole day," or "skip some classes." Students could give one of four answers: *none, one or two times, three or four times*, or *five or more times*. Our categorical principal components analysis (CATPCA) for both cross-national data and within-country data show that factor loadings were above .7 for most questions. Only Germany and Iceland showed a factor loading of .4 for arriving late for school. Consequently, we created for our cross-national analysis a latent variable for truancy that contains all possible questions from PISA. We also created a latent variable that contains only skip a whole day and skip some classes to control for the low factor loadings in Germany and Iceland. Checks show comparable results for both variables. These results are available on request.

In addition to individual truancy we computed *mean school truancy* by averaging the individual truancy score to the school level. Although we prefer data on the truancy at the classroom level, classroom-level data are not available for all countries. Therefore, we aggregate our behavior variables to the school level.

The third major independent variable is also a school-level variable, *mean classroom disruption*. PISA 2012 asked students to report on the following classroom conditions: "students don't listen," "wait for quiet," "cannot work well," "long time to start," and "noise and disorder." The possible answers were *all lessons, most lessons, some lessons*, or *never or hardly ever*. Therefore, information on disruptive student behavior is available only at the classroom level and not at the individual level. Unfortunately, PISA contains information only on classroom disruption, and not information on disruption at the individual level. Therefore, we could not test the influence of individual disruptive behavior as stated in our hypothesis. Questions on classroom disorder were answered by only two thirds of the respondents. CATPCA for both cross-national data and within-country data show factor loadings above or close to .7 for all individual answers. We used these individual students' perception of classroom disruption to

compute *mean classroom disruption* by averaging the individual latent disruption score of all students to the school level. We also reversed the order of the scores. Although student answers refer to the student experience and their interpretation of the question, we refer to the mean class disruption to make the text more readable.

Other individual-level variables

Family form

Family form is based on students' reporting on who they usually live with. They choose from the following options: mother, father, brothers, sisters, grandparents, and others. The 2012 PISA does not give the option of guardian mother or father, in contrast to some other years. A disadvantage of this measurement of family form is that it lacks information about the cause of single parenthood. Although we assume that in most OECD countries divorce or separation is the most common reason for single parenthood for 15-year-old students, there might be other reasons, such as birth out of wedlock without a subsequent marriage or cohabitation, or death of one biological parent. However, parents of 15-year-old students have generally a very low mortality rate, and the number of people who (intentionally or unintentionally) become a single parent prior to childbirth will be rather low. It is also possible that pupils consider their stepfather as their father or their stepmother as their mother. We are unable to separate these pupils from others who live with two biological parents. Any bias resulting from this problem only makes our estimations more conservative, which means that we are likely to underestimate the difference between two-parent families and the other family forms.

One advantage of the measurement of family form in the 2012 PISA is that students were asked with whom they regularly lived at home, and they were asked to identify them. Thus, family form is measured from the students' perspective, not from the viewpoint of interested parents or authorities. Parents who separated after cohabitation before the child reached the age of 15 are measured in the same way as formally divorced parents. This is not a problem, because separation after cohabitation has more or less the same effect on children as compared to divorce after marriage (Dronkers & Härkönen, 2008; Härkönen & Dronkers, 2006). On the contrary, the PISA measure actually provides a more accurate picture in countries where cohabitation with children is common. Additionally, married parents who are separated before the 15-year-old student participates in the PISA survey are treated in the same way as formally divorced parents. This is especially relevant for Catholic countries such as Italy, Ireland, Portugal, and Spain, where a formal divorce is still difficult to obtain. The only disadvantage is that some children might

live without a parent temporarily (e.g., fishermen). We believe, however, that this risk is small, as some students will still indicate that they live with both parents *usually*. We created a dummy variable indicating a single-mother family.

Parental ESCS

The index of economic, social and cultural status (ESCS) of the parents is a composite index created within the PISA data set of parents' occupational status, measured using the International Socioeconomic Index of Occupational Status scale (Ganzeboom et al., 1992), parents' educational level measured using the International Standard Classification of Education (ISCED) classification (UNESCO, 2006), and the presence of any material or cultural resources in the students' homes. *Higher track* refers to the track Levels 2A and 3A of the ISCED. The 2A and 3A programs ultimately lead to tertiary education (OECD, 1999). This control variable takes into account the possible early selection of children of single parents into a lower educational level, as a consequence of lower earlier performance. The result of controlling for educational level might be that the relationship between family form and a school's percentage of single-parent families is underestimated. However, we prefer this risk of underestimation to an overly easy confirmation of our hypotheses. We include the dummy track missing, representing 0.01% of students. Other tracks are the reference category.

Female

We compute a dichotomous variable to classify gender. Boys are the reference group.

Other school-level variables

All these school characteristics are computed with all deleted pupils included. We calculate the percentage pupils from single-parent families per school (either father or mother). To take into account nonlinearity, this variable is represented by five dummies, each of which contains approximately 20% of the students. The five dummy variables measure, respectively and at the school level, 0 to 5.5%, 5.5 to 9%, 9 to 12.5%, 12.5 to 17.5%, and 17.5 to 64% levels of pupils from single-parent families.

The mean ESCS per school is calculated using the ESCS score of all students in the school. We compute the percentage of females using the number of female students in each school. Percentage of immigrants is calculated using the number of immigrant students in each school. We compute this percentage before deleting immigrant students from our analytical sample.

Tables 1a (full population), 1b (single-mother family only) and 1c (two-parents only) give descriptive statistics of the variables used in our analyses.

Results

Comparing Tables 1, 2, and 3, we observe that the individual socioeconomic situation of pupils in single-mother families is quite different from that of pupils living in two-parent families. The parental social background of children of single

Table 1. Descriptive statistics: Total population.

	Minimum	Maximum	M	SD
Student ESCS		3.21	0.1908	0.89447
School ESCS	−2.08	1.57	0.1352	0.48818
Mean classroom disruption	−1.10	1.84	−0.0104	0.40970
Math score	173.63	848.35	510.3696	85.46271
Single mother	0.00	1.00	0.1129	0.31651
Female	0.00	1.00	0.5039	0.49999
Higher track	0.00	1.00	0.7738	0.41837
Track missing	0.00	1.00	0.0001	0.00831
Percentage migrants[a]	0.00	97.06	9.3236	12.52512
Percentage female[a]	0.00	100.00	50.1100	17.84255
0%–5.5% single parents	0.00	1.00	0.1987	0.39901
5.5–9% single parents	0.00	1.00	0.2007	0.40056
9–12.5% single parents	0.00	1.00	0.1792	0.38352
12.5–17.5% single parents	0.00	1.00	0.2137	0.40990
17.5–64% single parents	0.00	1.00	0.2077	0.40566
Individual truancy	−0.60	7.58	−0.0399	0.94170
Mean truancy school	−0.60	2.12	−0.0140	0.36507

Note: N = 173,769. ESCS = economic, social and cultural status. Computation from Program for International Student Assessment 2012.
[a]Mean centered at country level in analysis.

Table 2. Descriptive statistics: Single-Mother families.

	Minimum	Maximum	M	SD
Student ESCS	−3.60	3.12	−0.0544	0.86546
School ESCS	−1.94	1.57	0.0963	0.46879
Mean classroom disruption	−1.10	1.84	0.0210	0.41610
Math score	182.98	786.11	499.9169	84.77857
Single mother	1.00	1.00	1.0000	0.00000
Female	0.00	1.00	0.5352	0.49877
Higher track	0,00	1.00	0.7506	0.43267
Track missing	0.00	1.00	0.0001	0.00714
Percentage migrants[a]	0.00	95.83	10.8444	14.10203
Percentage female[a]	0.00	100.00	50.4745	17.37484
0%–5.5% single parents	0.00	1.00	0.0389	0.19344
5.5–9% single parents	0.00	1.00	0.1165	0.32088
9–12.5% single parents	0.00	1.00	0.1576	0.36434
12.5–17.5% single parents	0.00	1.00	0.2632	0.44038
17.5–64% single parents	0.00	1.00	0.4238	0.49417
Individual truancy	−0.60	7.58	0.0988	1.08241
Mean truancy school	−0.60	1.92	−0.0121	0.36472

Note: N = 19,624. ESCS = economic, social and cultural status. Computation from Program for International Student Assessment 2012.
[a]Mean centered at country-level in analysis.

Table 3. Descriptive statistics: Both parents at home.

	Minimum	Maximum	*M*	*SD*
Student ESCS	−5.32	3.21	0.2221	0.89328
School ESCS	−2.08	1.57	0.1401	0.49037
Mean classroom disruption	1.10	−1.84	0.0144	0.40870
Math score	173.63	848.35	511.7004	85.45800
Single mother	0.00	0.00	0.0000	0.00000
Female	0.00	1.00	0.4999	0.50000
Higher track	0.00	1.00	0.7768	0.41642
Track missing	0.00	1.00	0.0001	0.00845
Percentage migrants[a]	0.00	97.06	9.1299	12.29644
Percentage female[a]	0.00	100.00	50.0636	17.90073
0%–5.5% single parents	0.00	1.00	0.2190	0.41358
5.5–9% single parents	0.00	1.00	0.2115	0.40835
9–12.5% single parents	0.00	1.00	0.1820	0.38581
12.5–17.5% single parents	0.00	1.00	0.2074	0.40543
17.5–64% single parents	0.00	1.00	0.1802	0.38434
Individual truancy	−0.60	7.58	−0.0576	0.92075
Mean truancy school	−0.60	2.12	−0.0143	0.36511

Note: N = 154,145. ESCS = economic, social and cultural status. Computation from Program for International Student Assessment 2012.
[a]Mean centered at country level in analysis.

mothers is lower (−.05) whereas this score for children with two parents is .22. This difference is less pronounced for the social composition of schools: Children of single mothers attend schools with a lower parental socioeconomic background (.10), whereas this score for children with two parents is .14. Also note that only 3.9% of children of single mothers attend a school with less than 5.5% of pupils with single parents, whereas this percentage for children with two parents is 21.9%. On the other hand 42.4% of children of single mothers attend a school with more than 17.5% of pupils with single parents, whereas this percentage for children with two parents is 18.0%. The individual truancy score of children of single mothers is .10, and this score for children with two parents is −.06. Mean classroom disruption of children of single mothers is .02, whereas this score for children with two parents is −.01. It is thus not surprising that children of single mothers have a 499.9 math score, whereas this score for children with two parents is 511.7.

However, for a more definitive test of our hypotheses, we must control for confounding variables; this is carried out in the following sections, in which we apply multilevel analysis with three levels: students, schools, and countries.

Individual truancy

Table 4 presents regressions that examine how individual truancy is predicted by other independent variables. Model 0 contains only one variable: living in a single-mother family versus a two-parent family. This model gives a baseline estimate of the difference in the level of truancy between a pupil living with a single mother versus a two-parent family. There is borderline significant variance of the parameter of the variable single mother at the country level.

Table 4. The effects of single-mother children, percentage of single-mother children, and classroom disruption on individual truancy in cross-national program for international student assessment data.

	Model 0		Model 1		Model 2		Model 3	
	B	SE	B	SE	B	SE	B	SE
Constant	−0.130	0.041	0.023	0.042	−0.005	0.044	−0.013	0.043
Single mother	0.168*	0.015	0.168*	0.007	0.161*	0.007	0.161*	0.007
Individual ESCS			−0.034*	0.003	−0.035*	0.003	−0.035*	0.003
School ESCS			−0.098*	0.008	−0.081*	0.008	−0.052*	0.008
Female			−0.052*	0.004	−0.050*	0.005	−0.050*	0.005
Higher track			−0.136*	0.013	−0.132*	0.013	−0.116*	0.012
Track missing			0.558*	0.261	0.569*	0.261	0.573*	0.261
Percentage migrants					0.003*	0.000	0.003*	0.000
Percentage female					−0.000	0.000	−0.000	0.000
5.5–9% single parents (ref: 0–5.5% single parents					0.000	0.010	−0.004	0.010
9–12.5% single parents					0.005	0.011	−0.002	0.011
12.5–17.5% single parents					0.031*	0.010	0.021*	0.010
17.5–64% single parents					0.041*	0.011	0.025*	0.011
Mean classroom disruption							0.140*	0.008
Variance								
Country	0.046	0.012	0.046	0.012	0.049	0.013	0,047	0,013
School	0.050	0.001	0.046	0.001	0.045	0.001	0,042	0,001
Student	0.786	0.003	0.785	0.003	0.785	0.003	0,785	0,003
−2*log-likelihood	458,232		457,502		457,363		457,079	

Note: Countries n = 28; schools n = 8,196; students n = 173,769. ESCS = economic, social and cultural status. Computation from Program for International Student Assessment 2012.
*$p < .05$.

Model 1 adds several variables: the socioeconomic background of the student (ESCS) and the school ESCS. The higher the individual ESCS and school ESCS, the lower the level of truancy. Students who live in a single-mother family, however, still have a significantly higher level of truancy compared to students from two-parent families.

In Model 2, we add other school and individual characteristics to the equation of Model 1, especially schools' percentage of single parents. This addition hardly changes the results for living in a single-mother family: These students have nearly the same individual level of truancy. Interestingly, though, we also find that the higher the school's percentage of single parents, the higher the level of truancy. This suggests that percentage of single-parent families in a school greater than 12.5% increases individual truancy level, even controlling for other relevant individual and school characteristics.

We test this result with Model 3, in which we include the mean school level of classroom disruption. As we might expect, we find that the higher the mean level of classroom disruption of a school, the higher the level of truancy by the student. The effects of school percentage of single parents become smaller but remain significant after this inclusion of school level of classroom disruption. Even this addition hardly changes the results for living in a

single-mother family: These students have higher levels of individual truancy, irrespective of the school level of classroom disruption or school percentage of single parents. This supports our first hypothesis that children living in single-parent families have higher levels of individual truancy than children in two-parent families. We also conclude that higher percentages of single-parent families per school increase individual truancy. This supports our third hypothesis that there is a positive relation between schools' percentage children of living in single-parent families and individual truancy.

Math score

We analyze in Table 5 whether individual truancy, classroom disruption, and school truancy level can explain the negative effect of single-parent families and school percentage of single parents on educational performance.

Model 0 contains only one variable: living in a single-mother family instead of a two-parent family. This model gives a baseline estimate of the lower math score level of a pupil living with a single mother (7.6 points) compared to those in two-parent families.

Model 1 of Table 5 shows the earlier finding that a high of percentage single parents has a negative effect on the educational performance of all pupils in a given school. Living in a single-mother family also had a significant negative effect on educational performance, even after controlling for percentage of single parents .

We include in Model 2 the level of classroom disruption as perceived by the student. This variable has the expected negative effect on educational performance, and the effect of school percentage of single-parent families decreases but remains significant. The negative effect of single-mother family hardly changes from this addition. This supports our first hypothesis that children living in single-parent families have lower educational performance than children in two-parent families.

Inclusion of the individual level of truancy in Model 3 lowers the effect of school percentage of single-parent families only slightly, without making the effect insignificant. The effect of living in a single-mother family becomes insignificant, however, after addition of individual truancy. This means that the effect of living in a single-mother family on math score can be explained by individual truancy. In other words, if there are options to hamper truancy of children of single mothers, the educational performance of these children will be comparable to those pupils with two parents. This supports our second hypothesis that individual level of truancy partly explains the negative relation between living in single-parent family and educational performance).

In Model 4, we add the school level of truancy. This school-level variable has a negative effect on educational performance, independent of our other school and individual variables. The negative effect of school percentage of

Table 5. Effects of single-mother children and percentage of single-mother children and explanatory mechanisms on math performance in cross-national program for international student assessment data.

	Model 0		Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE	B	SE
Constant	507.480	3.375	478.875	4.610	481.469	4.331	481.695	4.255	480.499	4.293
Single mother	−7.600*	0.540	−1.820*	0.528	−1.802*	0.528	0.103	0.523	0.075	0.523
Individual ESCS			17.816*	0.217	17.828*	0.217	17.411*	0.214	17.427*	0.214
Mean school ESCS			58.005*	0.966	52.746*	0.960	52.113*	0.941	49.676*	0.940
Female			−16.026*	0.345	−16.020*	0.345	−16.615*	0.341	−16.595*	0.341
Higher track			34.276*	1.145	33.038*	1.136	31.298*	1.120	31.249*	1.115
Track missing			−34.405	20.006	−34.702	19.989	−29.228	19.748	−28.320	19.740
Percentage migrants			0.035	0.029	0.035	0.029	0.066*	0.028	0.124*	0.028
Percentage female			0.041	0.023	−0.005	0.022	−0.006	0.022	−0.023	0.021
5.5–9% single parents			0.735	1.303	1.493	1.259	1.459	1.234	1.458	1.215
(ref: 0–5.5% single parents)										
9–12.5% single parents			−1.613	1.352	−0.518	1.306	−0.540	1.280	−0.287	1.261
12.5–17.5% single parents			−4.379*	1.276	−2.726*	1.235	−2.470*	1.211	−1.614	1.193
17.5–64% single parents			−8.113*	1.320	−5.246*	1.281	−4.972*	1.256	−3.748*	1.239
Mean school disruption					−24.239*	1.002	−22.553*	0.983	−19.106*	0.991
Individual truancy							−11.963*	0.181	−11.593*	0.183
Mean school truancy									−21.557*	1.336
Country	306.612	84.939	514.732	139.391	449.004	121.700	433.409	117.447	444.276	120.285
School	2399.268	41.723	1074.634	20.617	987.877	19.241	945.521	18.484	909.644	17.915
Student	4729.361	16.435	4466.067	15.518	4465.861	15.516	4360.166	15.149	4359.991	15.148
−2*log-likelihood:	1,983,128		1,967,961		1,967,395		1,963,103		1,962,847	

Note: Countries n = 28; schools n = 8,196; students n = 173,769. ESCS = economic, social and cultural status. Computation from Program for International Student Assessment 2012.
*p < .05.

single-parent families decreases further but remains significant for more than 17.5% of single-parent families. This supports our fourth hypothesis that negative relation between schools' percentage of children living in single-parent families can partly be explained by schools' level of truancy and schools' level of classroom disruption).

Decreases in the effects from mean school ESCS and mean school disruption via addition of school level of truancy suggest that a portion of the effects of these school variables are intermediated by school truancy policies.

Conclusion

This study controls whether difficult teaching and learning processes (measured via classroom disruption, individual truancy, and school-level truancy) explain the disadvantage in school performance for students from single-mother families and students in schools with a high percentage of single mothers. First, living in a single-mother family affects truancy, even controlling for confounding factors, confirming our first hypothesis. This supports the finding in the literature that the lack of effective parental supervision of children by single parents (related with the family instability) relates with level of truancy. Second, truancy explains the negative relationship between single-mother families and school performance, confirming our second hypothesis. Third, the concentration of single-parent families in particular schools affects teaching conditions and learning time, as proxied by truancy in this study. Fourth, we find that the school-level measure of classroom disruption and truancy explains some of the negative effect of school-level concentration of students from single-parent families on individual students' math performance. However, in the face of the school-level measure of classroom disruption, the effect of a school's percentage of single-parent families remains significantly negative with respect to individual performance. This effect indicates support for the social capital explanation; that is, schools with a large concentration of children from single-parent families (more than 17.5%) are usually characterized by less social capital (indicated by parents' social relations and networks with other parents). This result is consistent with Pong (1997) and Sun (1999). Another possible explanation of this effect is that school classroom disruption and school truancy do not fully capture the condition of teaching and learning in schools because individual disruptive behavior during lessons is not captured in the data set.

Pupils living in a single-mother family do not perform significantly worse than other pupils if we control for individual truancy. This indicates that good parental supervision by single mothers or other interventions that ensure that these children attend school might counterbalance all disadvantages associated with divorce and separation in terms of academic outcomes. However, living in a single-mother family increases the risk of truancy as well as the probability of attending a school with higher percentages of single-parent families and higher school truancy levels.

These factors, in turn, influence negatively these pupils' educational performance. The effect of single-mother family on educational performance thus seems to be indirect, and could be explained by parents' ability to prevent their children from engaging in truancy.

This study is the first attempt to unravel the interesting and important effect of both family form and a school's concentration of single-parent families through examination of the school's teaching and learning processes. It is important to analyze the compositional effect of single parenthood further. Although single parenthood as a consequence of divorce or separation is a decision made by two individuals, this decision nevertheless affects the life chances of not only their own children, but other children as well. Claims about the causal effects of single motherhood or the percentage of single parents on school performance should be made with caution, as we use cross-sectional data. We attempt to compensate for this limitation by controlling for a number of explanatory variables and by theoretically founding the expected relationships. Although longitudinal studies on divorce and school performance are more selective, future research should replicate our results using longitudinal data.

This study indicates that policies that stimulate single-mother families to more closely monitor the truancy of their children (Kearney, 2008) could reduce a portion of the disadvantage in school performance for students from single-mother families. Also, policies that focus on truancy and emotional problems of the children (Amato & Cheadle, 2005) might influence truant behavior of children from single-mother families. Therefore, parents, social workers, teachers, and programs for divorced parents (Jewell, Schmittel, McCobin, Hupp, & Pomerantz, 2017) should focus on reducing emotional problems that children of divorced parents more frequently experience.

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