

Schools with high proportions of students from single-parent families and low performance. Lower teaching and learning conditions or less social capital?

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Abstract

We address with the 2012 wave of the international PISA data, measuring performance and background of 15-years-old pupils in all OECD countries to unravel the mechanisms behind the negative influence of single parenthood and the proportion of single-parent families on school performances. We find that pupils living in a single-mother family do not perform significantly worse than other pupils, but only if we control for individual truancy. The school-level measure of classroom disruption and truancy mediate some of the negative effect of the school's concentration of students from single-parent families on individual students' math performance. However, the school's percentage of single-parent families remains significantly negative on individual performance.

Introduction

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

These studies in the United States (Pong, 1997; 1998) and in 25 OECD countries that include the United States (De Lange, Dronkers & Wolbers, 2014) found that the both being a child of a single-parent and the share of single-parent families at school negatively affects children's educational performance. Two explanations are given: the decline of the social network of the school community; and the lower amount of teaching and learning time at school and at home. However, the mechanisms behind the relationships are not empirically tested yet.

In this paper, we further examine the second explanation using both truancy and classroom disruptions as a measure of the teaching and learning condition in school. We address the following questions: (1) Does the family context of students from single-parent families affect truancy? (2) Does the school's composition of students from single-parent families affect classroom disruptions and the mean truancy in school? (3) Does truancy mediate the negative effect of the family context of students from single-parent families on educational performances? (4) Do classroom disruptions mediate 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 positively, then the second explanation for the negative effect of the family context and school's composition of students from single-parent families on students' educational performance is supported. The condition of teaching and learning in school may be as important as, if not more than, the community network explanation.

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Theory

Family context

Children of single parent families have lower school performances than children from two-parent families (De Lange, Dronkers & Wolbers, 2014; Pong, Dronkers & Hampden-Thompson, 2003). As previously described (Amato & Cheadle 2005), children of divorced parents tend to have more emotional and other problems than other children. Garriga (2010) found that children of single-parent families are more often late at school than are other children. Moreover, Wallerstein, Lewis and Packer Rosenthal (2013) show that adolescents engaged in truancy after divorce of their parents, using qualitative longitudinal data. Moreover, Kearney (2008) suggests that children might be predisposed toward absenteeism via family contexts that does not closely monitor school attendance. Although, Wallerstein, Lewis and Packer Rosenthal (2013) mention that truancy subsided when the mother resumed supervision and stabilized family life, the study of Garriga (2010) including both parents that recently divorced and longer ago divorced suggests that stabilization and resumed supervision is not necessary the case. Moreover, Miller and Plant (1999) show a relationship between single parenthood and truancy. Consequently, we expect higher truancy rates for single parent children. Finally, truancy also decreases the use of learning opportunities. Consequently, we expect that truancy mediates between the family context and the school performances.

School context

Parental influence on children often extends beyond the home to reach the communities in which the family lives and to the school communities where the family is connected. Previous research has shown that the type of students is one of the most important factors influencing students' school achievement. 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 home. All children attending schools with high concentration of single-parent families tend to perform less well than children in schools with low concentration of single-parent families (Pong 1997; Pong 1998).

In addition to this parental network explanation for the negative contextual effect of single-parenthood on children's educational performance, Dronkers (2010) emphasizes 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 that is 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. If there are more students in a class with such problems, more learning and teaching time of the whole class might be used for non-academic goals. A higher percentage of pupils from single-parent families in a school might thus lead to more pupils' tardiness, disturbing teaching and learning. Insufficient teaching and learning time may prevent students from a certain educational performance. Conversely, students in a class with few peers from single-parent families may enjoy more and uninterrupted teaching and learning time and are more likely to perform better, given identical class schedules.

Data and variables

Data

We use data from the 2012 Program for International Student Assessment (PISA). The cross-national PISA contains information of social economic background and classroom behaviors of 15-year-old students from OECD and other developed countries (OECD, 2013). We focus on 28 Western countries containing information on 233,467 students. These 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, Slovak Republic, Slovenia, Sweden, and the United States. We omit 3.4 percent of the 233,467 students because they have fewer than 8 school peers who provide valid answers for the questions on classroom disorder or truancy. Furthermore, we omit 1.6 percent of our sample due to missing information on the home situation, and another 1.4 percent due to missing data on other independent variables. We only analyze 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 bias our results. To further reduce potential bias we also exclude migrant pupils whose families may be in transition from their origin to the host country, and that single-parenthood would have a different meaning for them (Dronkers & Kalmijn, 2013). Consequently our working sample contains data of 173,669 students in 8,196 schools in 28 countries.

Variables

Dependent Variable

The dependent variable in this study is students' math performance on the math test developed by PISA. To reduce the testing time, PISA created five different booklets containing a number of very similar but shorter test questions. Different students may receive different booklets. Because such different tests can never offer exactly the same degree of difficulty, Item Response Modeling (IRM) was used to achieve comparable results between students who took different tests. 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 take into account the between- and within-regression standard errors. The resulting math scores were then standardized for the Organization for Economic Co-operation and Development (OECD) countries using an average of 500 and a standard deviation of 100.

Independent Variables Indicating Teaching and Learning Conditions

Three major independent variables were constructed to measure the condition of teaching and learning in school. The first is *truancy* for each individual student. Students were asked if, in the last two weeks, they 'arrive late for school', 'skip a whole day', 'skip some classes'. Students can give one of these 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 most factor loadings were above 0.7 for the questions.²

² Only Germany and Iceland show a factor loading of 0.4 for 'arrive late for school'.

Consequently, we created for our cross-national analysis a latent variable for truancy that contains all possible questions from PISA.³

Besides the individual *truancy* we also computed the *mean school truancy* by averaging individual truancy score to the school level.

The third major independent variable is also a school-level variable. It is the *mean classroom disruption*. PISA 2012 asked students to report on the condition of their classroom regarding the following: ‘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’. These questions about classroom disorder were only answered by two-thirds of the students. CATPCA for both cross-national data and within-country data show that factor loadings above or close to 0.7 for all questions. We used these individual students’ perception of classroom disruption to compute the *mean classroom disruption* by averaging the individual disruption score of all students to the school level (we also reversed the order of the scores).⁴

Other Individual-level Variables

Family forms. The family form is based on the student’s report on who they usually live with. They could choose any of 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 waves. 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.⁵ 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.

An advantage of the measurement of family form in 2012 PISA is that students were asked with whom they regularly lived at home, and they were asked to identify them. Thus, the family form is measured from the student’s perspective, not from viewpoint of interested parents or authorities. Parents who separated after cohabitation before the child reaches 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 also treated in the same way as formally divorced parents. This is especially relevant for catholic countries like Italy, Ireland, Portugal and Spain, where a formal divorce is still difficult to obtain. The only disadvantage is that some children may live

³ 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. Results are available on request.

⁴ Although the answers of the students refer to the experience of the students and the interpretation of the question, we will refer in this paper to the mean class disruption to make the text more readable.

⁵ However, parents of 15-year old students are generally still too young to die, and the number of people who (intentionally or unintentionally) become a single parent already prior to childbirth will be rather low.

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

Parental ESCS. The ESCS index of the parents is a composite index created within the PISA dataset of the parents' occupational status, measured with the International Socio-economic Index of Occupational Status (ISEI) scale (Ganzeboom et al, 1992), the educational level of the parents, measured with the ISCED (International Standard Classification of Education) classification (UNESCO, 2006), and the presence of any material or cultural resources at the students' homes.

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

Higher track refers to the track levels 2A and 3A of the International Standard Classification of Education (ISCED). The 2A and 3A programmes 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 school's percentage of single parent families is underestimated. However, we prefer this risk of underestimation above a too easy confirmation of our hypotheses. We include the dummy "track missing", representing 1.1 percent of the students. Other tracks are the reference category.

Other School-level Variables

All these school characteristics are computed with all deleted pupils included.

We calculated 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 twenty percent of the students. The five dummy variables measure, respectively and at the school level, 0-5.5 percent, 5.5-9 percent, 9-12.5 percent, 12.5-17.5 percent, and 17.5-64 percent of pupils from single-parent families.

The *mean ESCS per school* was calculated using the ESCS score of all students in the school.

Percentage of females. We computed the percentage of females using the number of female students in the schools.

Percentage of immigrants was calculated using the number of immigrant students in schools.⁶

Table 1 gives the descriptive statistics of the variables we use in our analyses.

Results

All analyses are multi-level analysis with three levels: students, school and countries.

Individual classroom disruption

Table 2 shows regressions that examine how individual truancy is predicted by other independent variables. Model 0 contains only one variable: living in a single-mother instead of a two-parent family. It gives a base line estimate of the level of truancy of a pupil living with a single-mother. There is a borderline significant variance of the parameter of the variable single-mother at the country-level.

⁶ We computed this percentage before deleting the migrant students out our analytical sample.

Model 1 adds a few variables: the socio-economic background of the student (ESCS) and the school ESCS. The higher the individual ESCS and school ESCS the lower the classroom level of truancy. But students who live in a single-mother family perceive more often classroom disruption.

In model 2 we add other school- and individual characteristics to the equation of model 1, especially the school percentage single parents. This addition hardly changes the results for living in a single-mother family: they have nearly same level of truancy. But interestingly we also find that the higher the school percentage single parents, the higher the level of truancy. This suggests that percentages of single-parent families in a school larger than 12.5% increase individual truancy level, even controlled for other relevant individual and school characteristics.

We test this result with model 3, in which we includes 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 the school percentage single parents become smaller but remain significant by this inclusion of the school level of classroom disruption. Even this addition hardly changes the results for living in a single-mother family: they have higher levels of individual truancy, irrespectively of the school level of classroom disruption or school percentage of single parents. We draw as a conclusion that higher percentages single-parent family per school increase individual truancy.

Math score

We analyse in table 3 whether individual truancy, classroom disruption and school truancy level can explain the negative effect of single-parent families and school percentage single parents on educational performance.

Model 0 contains only one variable: living in a single-mother instead of a two-parent family. It gives a base line estimate. It gives a base line estimate of the lower math score level of a pupil living with a single-mother (7,6 points). There is no significant variance of the parameter of variable single-mother at the country-level.

Model 1 of table 4 shows the well-known outcome that high percentage single parents at schools has a negative effect on the educational performance of all pupils in that school. Living in a single-mother family has also a negative significant effect on educational performance, also if controlled for percentage single parents at school.

We include in model 2 the school level of classroom disruption as perceived by the student. That variable has the expected negative effect on the educational performance, and the effect of school percentage single-parent families decreases but remains significant. The negative effect of single-mother family hardly changes by this addition.

The inclusion of the individual level of truancy in model 3 lowers the effect of school percentage single-parent family only a bit, without making it insignificant. There is a significant variance of the parameter variable truancy at the country-level. But the effect of living in a single-mother family becomes insignificant by the addition of individual truancy. This means that the effect of single-mother on math score is indirect, mediated by truancy. In other words, if the single-mother manages to maintain regularity and order in her family (and thus hampers truancy) the educational performance of her children is comparable to those pupils with both parents in the same school.

In model 4 we add the school level of truancy. That school variable has also a negative effect on educational performance, independently of our school and individual variables. The negative effect of school percentage single-parent families decreases further but remains significant for more than 17.5% single-families per school.

The decreases of the effects of mean school SES and mean school disruption by the addition of the school level of truancy suggest that a part of the effects of these school variables are intermediated by truancy policy of schools.

Conclusion

Given our results, we can answer our four research questions positively.

First, single-mother families affect truancy.

Second, the truancy mediates between the negative relationship between the single-mother family and school performances.

Third, the concentration of single-parent families in school affects the condition of teaching and learning in schools, indicated by truancy in this study. The negative school compositional effect on individual truancy cannot be fully explained by individuals' membership in single-mother families.

Fourth, we found that the school-level measure of classroom disruption and truancy mediate some of the negative effect of the school's 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 school's percentage of single-parent families remains significantly negative on individual performance. This remaining effect gives support to the social capital explanation: schools with a large concentration of children from single-parent families (more than 17.5%) are usually characterized by less social capital (i.e. indicated by parents' social relations and networks with other parents). This result is consistent with previous studies by Pong (1997) and Sun (1999). Another explanation of this remaining effect might be that school classroom disruption and school truancy do not fully capture fully the condition of teaching and learning in schools.

Pupils living in a single-mother family do not perform significantly worse than other pupils if we control for individual truancy. This means that good parental supervision by single mothers who ensure that their children attend school may counterbalance all disadvantages associated with divorce and separation in terms of children's academic outcomes. However, living in a single-mother family increases the risk of truancy and also the chance to attend 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, mediated parents' ability to prevent their children from playing truant.

The analyses of these contexts of single-parenthood are also important because that will learn us more about the processes, which bring about the relative strong variation in negative outcomes of various family forms (Pong, Dronkers & Hampden-Thompson, 2003).

This study is the first attempt to unravel the interesting and important effect of both family forms and schools' concentration of single-parent families by looking inside the school's teaching and learning process. 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 taken by two individuals, this decision nevertheless affects the life chances of not only their children but other children as well. Our next step is to replicate our result using longitudinal data.

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Table 1a: Descriptive Statistics total population

	Minimum	Maximum	Mean	Std. Deviation
Student ESCS	-5,32	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*	0,00	97,06	9,3236	12,52512
Percentage Female*	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

Notes: own computation PISA 2012. *Mean centered at country-level in analysis. N=173769

Table 1b: Descriptive Statistics single-mothers

	Minimum	Maximum	Mean	Std. Deviation
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*	0,00	95,83	10,8444	14,10203
Percentage Female*	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

Notes: own computation PISA 2012. *Mean centered at country-level in analysis. N=19624

Table 1c: Descriptive Statistics both parents at home

	Minimum	Maximum	Mean	Std. Deviation
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*	0,00	97,06	9,1299	12,29644
Percentage Female*	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

Notes: own computation PISA 2012. *Mean centered at country-level in analysis. N=154145

Table 2: Regression analysis of individual truancy

	Model 0		Model 1		Model 2		Model 3	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
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*loglikelihood	458232		457502		457363		457079	

Source: own computation of PISA wave 2012; n-countries = 28; n-schools = 8196; n-students = 173769; * significant <.05

Table 3: The effects of the school composition and classroom disorder on math score.

	Model 0		Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
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 (ref 0%-5.5% single parents)			0,735	1,303	1,493	1,259	1,459	1,234	1,458	1,215
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*loglikelihood:	1983128		1967961		1967395425		1963103		1962847	

Source: own computation of PISA wave 2012; n-countries = 28; n-schools = 8196; n-students = 173769; * significant <.05