Childhood family dissolution and school outcomes:
The timing of dissolution effects.

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Abstract

Existing studies estimate negative effects of family dissolution; however, evidence regarding *when* such effects appear is lacking. The effect is difficult to isolate for at least two reasons: families select into dissolution, and the effects might be observed before, during and after dissolution. This paper presents evidence regarding the timing of dissolution effects. Family fixed effects (FEs) and a value-added model handle selection; timing is addressed exploiting repeated observations of student performance before and after dissolution. I present evidence of weaker performance among students from dissolving families, an effect mainly driven by the deterioration of family relations *before* the break. The divorce itself seems to be less important.

Childhood family dissolution and school outcomes: The timing of dissolution effects.

Ever since Coleman et al. (1966) linked the poor academic performance of black students to the breakdown of the black family, empirical researchers have been concerned with the effects of family dissolution on student performance. The increasing number of children who have been exposed to family dissolution the recent decades has strengthened the relevance of such studies. Most studies find a negative correlation between academic performance and growing up in a dissolved family. However, estimating dissolution effects is difficult for at least two reasons: families select into dissolution; and the dissolution effects might be observed before, during, and/or after the dissolution.

The methodological issue addressed in much of the existing literature is separating the causal effects of dissolution from the effect of selection into dissolution (e.g. Ginther and Pollak, 2004; Björklund et al., 2007; Francesconi, et al., 2010). Researchers have controlled for background characteristics causing selection bias, or have exploited within family variations using a family fixed effect approach. Studies using these approaches find a negative causal effect of family dissolution on student performance (Biblarz and Raftery, 1999; Painter and Levine, 2000; Ermisch and Francesconi, 2001; Steele et al., 2009). In short, researchers seem to very much agree that the negative correlation reflects a combination of selection and causality.

Though agreeing on negative dissolution effects, much of the existing empirical literature is silent on the issue of timing. It has long been argued that family dissolution is a process and not a discrete event (Hetherington, 1979; Amato, 2000; Sigle-Rushton et al., 2014). Hence, the formal date of the change in family structure might not be a correct indicator of when dissolution effects appear. The home environment is likely to deteriorate prior to, during and keep deteriorating after a divorce. Furthermore, differences in outcomes recorded pre-, in- and post-divorce are likely to depend on the time span of the process in the individual family. Most existing studies have lacked appropriate data to fully integrate a processual view of a family dissolution in their estimations, and have therefore been unable to address the question of timing. One exception is Kim (2011), who estimates distinct effects of three phases in the dissolution process (pre-, in- and post-divorce).

The main contribution of this article is that it presents evidence on the timing of dissolutions effects. It adds to the small number of studies that aim to quantify the impacts of family dissolution on student performance at its different stages, while accounting for

selection and a processual view of dissolution. First, family FEs and a value-added model are used to isolate the impact of a family dissolution from the selection effect. Second, repeated observations of individual student outcomes over the schooling career are used to isolate the effects of a family dissolution pre-, in- and post-divorce.

I find evidence of a causal and significant negative effect of dissolution on student performance, after accounting for selection into family structures. Regarding the timing of dissolution effects, I find evidence that student performance is negatively affected before the family breaks up. The effect is visible within a three-year window of the formally recorded divorce. I do not find evidence that the divorce has any effect in itself; hence, deteriorations of the family leading up to the divorce are more important for student achievement than the actual divorce.

Data and summary statistics

The data comes from Statistics Norway and comprise information about entire cohorts of Norwegian students enrolled in 5th and 8th grade in the years 2007-2011 and 9th grade in 2010-2011, with information about academic performance and family background characteristics. Academic performance is measured by scores obtained on national tests. This facilitates an analysis of the effect of family dissolution in the short run in a sample of 9-14-year-old students. The data set is a balanced panel with 598 029 observations. Some students have records of participation on three tests, some on two and some on only one.

Family structure

The main variable of interest is family structure; the effect of living in an intact family (married or cohabiting) compared with living in a dissolving or dissolved family. Table 1 summarizes the distribution of family categories and the proportion of intact families in the sample. More than 70% of the students live in an intact family, with a higher percentage for 5th graders compared to 8th and 9th graders. Information about family composition is recorded at January 1st each year. The data indicate a large number of dissolutions during the observation period. Most of the families that dissolve during the years between 5th and 8th grade seem to be families of cohabiting parents. Dissolved families are families with one biological parent present, either as a single parent or together with a step parent. The data do not distinguish between the loss of a biological parent in the household due to death or due to divorce. However, the mortality rate among individuals between 30-50 years is very low and

unlikely to influence the estimated effects. The data do not indicate whether families are headed by a mother and a father or by same-sex parents.

Insert table 1 here.

Student test scores

The outcome variable is school performance measured by scores on national tests in reading and mathematics in 5th, 8th and 9th grades. The test scores are standardized with mean equal to 0 and standard deviation equal to 1, by test subject and cohort. The tests are held early in the fall semester. The same test is distributed to all schools and each student in a grade in a given year faces identical questions. Students receiving special language tuition (Norwegian) can apply to be exempted from taking the test; however, the participation rate is high. The sample includes students from all schools in Norway, public and private. There is a strong correlation between student performance on national tests and GPA in lower secondary school.

Summary statistics of the test scores are presented in table A1 in the appendix. The raw data suggest that students from dissolved families do not perform as well as their classmates who live with both biological parents; this seems to be true across all years, grades and subjects. Table 2 presents a comparison of 5th grade outcomes in 2007 between students from intact and dissolving families. Students from families that remain intact seem to perform better than students from families that are dissolved in 5th grade, or will experience a dissolution between 5th and 8th grade, or between 8th and 9th grade. Selection into family dissolution is not taken into account, so no conclusions can be drawn about the relation between family structure and performance.

Insert table 2 here.

Student and family characteristics

I have access to a number of individual student and family characteristics: student gender, birth order and immigrant status, and parents' age, work income after taxes and level of education (highest degree attained). In the descriptive statistics, parental education is grouped into four categories. In the regressions, parental education is included as a continuous variable (ranging 1-8), with primary school at the lower end of the scale and a PhD-degree at the higher, and an average of graduation from high school, with 13 years of schooling.

Table 3 compares family characteristics between intact and dissolved families. Dissolved families have, on average, a lower level of parent resources compared with intact families, specifically a lower level of parental education and work income. A regression is run

of a dummy for intact family on observable individual and family characteristics. The results are reported in the last column of table 3. The strongest predictors of family structure are parents' level of education and status as first or second generation immigrant. A higher level of parental education is associated with a higher probability of living in an intact family.

Insert table 3 here.

Empirical approach

To reduce selection bias in the estimated effect of family dissolution on student performance, the equation is estimated with controls for observed student and family characteristics and, thereafter, by the use of family FEs. The former approach makes use of the variation in exposure to family dissolution between and within families, the latter implies that the estimated family structure effect originates from comparisons of outcomes between *siblings* who are exposed to a change in family structure at different points in their schooling careers. The FE approach eliminates bias from time-invariant unobserved family characteristics but is not able to deal with unobserved family characteristics that differ between siblings and/or vary over time. Since parental income is most likely affected by family dissolution, it is included as a control variable in the fixed effect estimates.

The effect is identified through different treatments while keeping family background constant. Family FE models is assumed to produce unbiased estimates of the family dissolution effect if family structure does not respond to or correlate with, the individual characteristics of the children (Ermisch and Francesconi, 2001). In addition to differences in endowments of the children, this also includes differences in parental behavior toward them that affect both school outcomes and the probability of dissolution. This assumption might not be satisfied. For example, parents might choose to postpone a divorce to protect one of their children, who they think is less equipped to handle such a change in the home environment; or events such as sudden parental mental illness might influence both the ability to monitor child performance in school, and the probability that the parents split up.

Sigle-Rushton et al. (2014) provide evidence that it is important to include birth order in the family FE specification to avoid seriously biased estimates of divorce. In a sample with outcomes observed during a given time frame, the probability of experiencing family dissolution will be higher among students of high birth orders compared with students of low birth order. In addition, children of different ages (reflected in birth orders) might be more and less able to deal with such life-changing circumstances. In the analyses presented here, the

preferred specification includes family FEs, the student's birth order and an interaction between birth order and the indicator for family structure.

The FEs specification is portrayed in equation (1)

$$S_{ijgt} = \beta_1 F_{ijgt} + \beta_2 F_{ijgt} \times BO_i + X_{ijgt}\gamma + Y_{ijgt}\delta + \epsilon_j + \phi_t + u_{ijgt} \quad (1)$$

where S_{ijgt} is test score obtained by student i from family j in grade g in year t, F_{ijgt} is a family structure dummy taking the value 1 if family j of student i in grade g year t is intact, $F_{ijgt} \times BO_i$ is an interaction term between family structure and birth order of the student, X and Y are vectors of student and family characteristics, respectively, ϵ_j is a family FE, ϕ_t represents year dummies and u_{ijgt} is an error term. Note that in this specification, the effects of observed family characteristics are estimated from time variation in these variables.

The parameter of interest, β_1, is expected to have a positive sign; that is, I expect that students from intact families perform better than their peers from dissolved families in the specification that controls for observable family characteristics, and that siblings exposed to an intact family perform better than siblings in a dissolved family in the FE specification. The sign of β_2 (variations in the significance of family structure for academic performance across birth order) is less easy to predict. If β_2 equals zero, there is no evidence that the dissolution effect varies by age or birth order. Finding that $\beta_2 > 0$ implies that children of higher birth order (younger siblings) benefit more from living in an intact family.

While the FEs model is an appropriate approach to deal with self-selection, it does not address the process leading to divorce. Most dissolving families probably experience deteriorations in parental relations prior to dissolution, implying that the counterfactual to a divorce is provided by families where parental relations have deteriorated, but in which the parents have decided not to divorce. The counterfactual is unobservable, but it is a useful reference to clarify that family dissolution is a three-stage process; involving a pre-divorce, in-divorce and post-divorce phase. The most difficult phase to deal with in an econometric analysis is the post-divorce phase, because the relevant comparison group is hard to come by.

In this article, I (first and foremost) investigate whether there are any detectable effects of an upcoming divorce on student performance. I can do this because I know the point of family dissolution by good approximation, and the data include information about student test scores at three points in the schooling career: 5th, 8th and 9th grades. This makes it possible to perform an analysis of the relation between academic achievement and changes in family

circumstances in the pre-divorce stage. Importantly, variation in the distance to the upcoming divorce makes possible a comparison of students in families that will experience a divorce in the near future and the more distant future to students who will *not* experience a divorce. Hence, it can be evaluated whether these subgroups are comparable during the pre-divorce stage. The time period used in this article (2007-2011 for 5th and 8th grade, and 2010-2011 for 9th grade) provides the necessary information for one cohort, the cohort that begins 5th grade in 2007.

First, I regress student outcomes in 5th grade on a dummy for later family dissolution to check whether students from families that will go through a divorce have poor outcomes at the pre-divorce stage. This could give an indication of how early the effects of the dissolution are visible; alternatively, it may reflect the importance of underlying family characteristics for school performance (selection).

I compare 5th grade test results of students who experience a family dissolution between 5th and 8th grade, or between 8th and 9th grade, to the control group of students from families that remain intact. The data contain information about 5th grade test results for 35 848 individuals from families that stay intact at least until 5th grade, and for 31 651 individuals from families that stay intact at least until 8th grade. Between 5th and 8th grade 2 327 (6.49%) individuals experience a family break up, for a family dissolution between 8th and 9th grade the corresponding figure is 709 students (2.24%). I estimate equation (2)

$$S_{ij,5,2007} = \lambda D_{ij,m-n,t+y} + X_{ijgt}\gamma + Y_{ijgt}\delta + u_{ijgt} \qquad (2)$$

where $S_{ij,5,2007}$ is test score for individual i from family j in 5th grade in year 2007, and $D_{ij,m-n,t+y}$ is a dummy indicating a family break up between grades m and n (5th and 8th grade, or 8th and 9th grade), $t + y$ years after the test.

The effects of an upcoming divorce, as estimated by equation (2), are biased due to unobservable family characteristics that correlate with both student performance and the probability of divorce. To reduce this bias, a value-added specification is estimated. The value-added specification differentiates away time-invariant characteristics at the student and family levels that might cause selection bias. Hence, this estimation strategy is able to combine a control for selection bias with the processual view of family dissolution. The model specification test suggested by Todd and Wolpin (2003) is included in the appendix (table A2). A concern regarding the value-added estimation that it might not be able to

produce a reliable measure of student performance trends, as the outcome variable is observed at most at three points in time. However, it is an improvement compared with the approach in equation (2).

I compare the value added between 5th and 8th grade for students who later experience a family dissolution (between 8th and 9th grade), to that of a control group of families that remain intact. Additionally, I compare the value added between 5th and 8th grade for students who experience a family dissolution in this period (between 5th and 8th grade), to that of a control group of families that remain intact. In this way, I can address the question of whether students who experience a dissolution in a post-period experience less negative consequences on achievement growth than students who experience a dissolution in the in-period.

The sample used in these regressions consists of students from the cohort enrolled in 5th grade in 2007, 8th grade in 2010 and 9th grade in 2011, with test score records for all three grades. This sample includes 43 883 individuals. Of these, 10 113 (23.05%) have families that are not intact at the time of 5th grade, 2 119 students (4.83%) experience a family dissolution sometime between 5th and 8th grade, and 709 (1.62%) between 8th and 9th grade.

Equation (3) is estimated:

$$S_{ij,m-n,t_1-t_2} = \alpha N_{ij,5,2007} + \lambda D1_{ij,5-8,2007-2010} + \rho D2_{ij,8-9,2010-2011} \tag{3}$$
$$+X_{ijt}\gamma + Y_{ijt}\delta + u_{ijt}$$

where $S_{ij,m-n,t_1-t_2}$ is value-added in test scores between grades m and n and years t_1 and t_2, $N_{ij,5,2007}$ is a dummy taking the value 1 if student i from family j does not live with both biological parents at the time of 5th grade in 2007, $D1_{ij,5-8,2007-2010}$ is a dummy indicating a formally recorded family dissolution between 5th and 8th grade, and $D2_{ij,8-9,2010-2011}$ a family dissolution between 8th and 9th grade.

Results
Student achievement in intact and dissolved families

Columns (1)-(2) and (4)-(5) in table 4 report the results from an OLS regression of test scores on the family structure dummy variable and controls. Living in an intact family is

associated with higher achievement on national tests. As in previous studies, the estimates are sensitive to the inclusion of controls for observable characteristics, which confirms selection into family structures: once observable family characteristics are accounted for, the influence of family structure is significantly reduced. Analyses not reported show that selection into family structures is largely attributable to differences in parental education. Columns (3) and (6) report the results from the family FE model. The results coincide with the OLS estimates. This approach eliminates bias from unobserved time-invariant characteristics at the family level (such as family orientation of the parents or the quality of the home environment) and is the preferred specification.

The effect of family intactness varies significantly across birth orders, as indicated by the interaction term between birth order and the intact family dummy; however, whether family intactness matters more for the younger or older siblings varies with estimation strategy. Estimates from between family variation (OLS) suggest that younger siblings (high birth orders) benefit more from living in an intact family than do older siblings (low birth orders); while this is reversed in the estimates from within family variation (FE).

The effect of family intactness for students of birth order one is positive and stable across both specifications (in reading)[1]; whereas the effect of family intactness for students of birth order three is larger when estimated with OLS but equals zero when estimated with FE[2]. Put differently, the estimates that are biased (OLS) suggest that both first- and third-born students benefit from family intactness, while the more plausible estimates (FE) suggest that third-born students have no effect of living in an intact family.

The zero effect of family intactness among third-born siblings can be explained by a processual view of dissolution. Dissolving families are likely to experience deteriorations of the family environment in advance of the dissolution, that affect the children negatively. For the first-born sibling, a divorce is experienced as a large loss, because (much of) their experience of living in an intact family is characterized by a high-quality environment and the divorce represent a dramatic change. Younger siblings, on the other hand, might not associate family intactness with the same quality, as they have had less time in a well-functioning family. Experiencing that the parents split up is a smaller shock for them than for the older siblings. Hence, estimates from within-family variation in family intactness suggest that a

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[1] OLS: $\frac{\partial S}{\partial Intact} = 0.045 + 0.017 \times 1 = 0.062$; FE: $\frac{\partial S}{\partial Intact} = 0.087 - 0.029 \times 1 = 0.058$

[2] OLS: $\frac{\partial S}{\partial Intact} = 0.045 + 0.017 \times 3 = 0.096$; FE: $\frac{\partial S}{\partial Intact} = 0.087 - 0.029 \times 3 = 0$

divorce has little or no influence for this group. Estimating family structure effects between and within families yields approximately the same effects for first-borns, as their pre-treatment circumstances are more similar across all families. In contrast, later-born children from dissolving families and families that remain intact have less in common, and the estimated effect is dependent on the comparison group.

Insert table 4 here.

Family structure effects in the pre-divorce phase

To investigate whether students are negatively affected prior to the break up, equation (2) is estimated. The results are reported in table 5. The basic finding is that an upcoming family dissolution seems to matter for academic performance when it occurs relatively close to the observed outcome, and more so for mathematics than for reading. The effect of dissolution is visible up to three years before the divorce, as indicated by the effects for the subsample of students exposed to a family break up between 5th and 8th grade. Students from families that dissolve between 8th and 9th grade do not perform significantly worse in 5th grade than students from families that remain intact. This suggests that the experience of a family dissolution has adverse effects on student performance and that the process begins, on average, within a three-year window before the formally recorded dissolution. Note that table 5 also provides evidence against selection into family structures as the sole determinant of the observed negative correlation, as selection would predict that also students from families that break up between 8th and 9th grade would stand out as disadvantaged in 5th grade. Hence, this suggests a causal relationship between unfavorable academic outcomes and the experience of family dissolution among young students.

Insert table 5 here.

The estimates provided so far cannot (easily) be used to compare the size of pre-divorce and in-divorce effects. The value-added model formulated in equation (3) can be used for this purpose. I concentrate on the value-added between the $5th$ and $8th$ grades and compare achievement growth of students who will experience divorce between the $8th$ and $9th$ grades to the achievement growth of students who will experience a divorce between the $5th$ and $8th$ grades. The results are reported in table 6. Both student subgroups experience a negative effect relative to the comparison group of students with intact families. The negative effects are larger in mathematics than in reading. Importantly, the effects do not differ across the two

subgroups, indicating that the divorce does not have an effect in itself. That is, the deterioration of family relations seems to be much more important than the legal dissolution.

Family structure effects in the post-divorce phase

I observe achievement growth as measured by value-added for all students between the 5_{th} and 9_{th} grades. Some of these students have experienced family dissolution before the 5_{th} grade, some between the 5_{th} and 8_{th} grades, and some between the 8_{th} and 9_{th} grades. By investigating whether the achievement growth between the 5_{th} and 9_{th} grade differs across these three student subgroups, one will have some indication of whether there are considerable post-divorce effects and whether the effects depends on the length of the post-divorce period relative to the pre-divorce period. Table 6 provides the results.

Insert table 6 here.

All three subgroups are negatively affected. The effects do not differ much across the three groups. That is, the achievement growth of students with a clean post-divorce period does not differ from the achievement growth for students that have experienced two years of pre-divorce and one year of post-divorce. These findings are supportive of the interpretation that students are negatively affected by the deterioration of family relations, and that dissolution in itself is less important.

The study by Kim (2011) presents estimates that provide a useful comparison to the results presented in this article. Kim uses test scores in reading and mathematics as outcome measures and studies younger children (kindergarten-3rd grade). Kim (2011) finds a lower performance among children from dissolving families compared to children from families that remain intact. The combined in-and-post-divorce effect in mathematics is negative and statistically significant. However, positive pre-divorce and non-significant negative in-divorce effects are found in mathematics, while no effects are found in reading. In contrast, the present study finds negative pre-divorce effects in both subjects. Hence, the present study finds different pre-divorce effects from those found in Kim (2011). This demonstrates the need for further attempts to quantify stage-specific effects of family dissolution.

Conclusion

This article exploits rich data combining information about the timing of divorce with information about student performance at different stages in their schooling careers, to highlight the relation between children's school performance and the process of family

dissolution. To set the stage, the effects of family dissolution are estimated using family FEs to account for selection into family structures. These estimations provide evidence of a causal and significant negative effect of dissolution on student performance and suggest that the effect varies over the divorce process.

I argue that much of the existing literature is silent about *when* the negative effects appear. In particular, offspring might be negatively affected by the deterioration of family relations that occurs prior to the dissolution. I find evidence that individual students are negatively affected in the pre-divorce phase: a statistically significant negative trend in student achievement is visible up to three years before a divorce. Some additional evidence indicates that the divorce itself contributes little to the negative effects.

Contrasting conclusions drawn in this article and the most relevant comparison paper, Kim (2011), indicate that more empirical studies are needed, specifically, more studies combining a processual view with a discussion of selection into dissolution.

Finally, a limit of this analysis is linked to the outcome studied, performance on standardized tests in reading and mathematics. It should be kept in mind that such an outcome is not a perfect measure of students' overall academic success and, importantly, is not a reflection of their well-being. Hence, the results presented in this paper are not suggested to capture the total effect of dissolution on children, academically or in general. However, the outcomes studied might give important indications of the effects divorce has on children, and are helpful for comparison purposes.

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Appendix

Table A1
Descriptive Statistics: Mean Test Scores across Family Structures

Year	Family Structure	5th grade Read	5th grade Math	N	8th grade Read	8th grade Math	N	9th grade Read	9th grade Math	N
2007	Intact	0.075 (0.986)	0.094 (0.971)	38 740	0.119 (0.965)	0.125 (0.983)	36 482	-	-	0
	Non-intact	-0.103 (0.998)	-0.132 (0.998)	12 508	-0.110 (0.981)	-0.154 (0.975)	13 879	-	-	0
2008	Intact	0.078 (0.979)	0.088 (0.989)	37 692	0.116 (0.972)	0.128 (0.977)	35 644	-	-	0
	Non-intact	-0.100 (0.998)	-0.133 (0.978)	11 974	-0.091 (0.981)	-0.132 (0.979)	13 995	-	-	0
2009	Intact	0.079 (0.978)	0.098 (0.991)	37 692	0.121 (0.953)	0.116 (0.993)	35 614	-	-	0
	Non-intact	-0.083 (0.999)	-0.146 (0.974)	11 705	-0.068 (0.979)	-0.133 (0.981)	14 235	-	-	0
2010	Intact	0.077 (0.990)	0.101 (0.985)	37 200	0.116 (0.977)	0.133 (0.983)	35 890	0.125 (0.959)	0.130 (0.971)	35 182
	Non-intact	-0.092 (0.976)	-0.134 (0.987)	11 409	-0.097 (0.971)	-0.157 (0.972)	14 228	-0.085 (0.998)	-0.129 (0.993)	14 995
2011	Intact	0.093 (0.968)	0.102 (0.984)	36 452	0.126 (0.960)	0.137 (0.973)	36 256	0.137 (0.939)	0.147 (0.960)	35 862
	Non-intact	-0.071 (0.984)	-0.134 (0.980)	11 149	-0.089 (0.976)	-0.149 (0.977)	14 217	-0.085 (0.986)	-0.141 (0.983)	15 029

Note. The test scores are standardized with mean 0 and standard deviation 1. 'Intact' indicates families with both biological parents present. 'Non-intact' indicates that one of the parents has moved out of the household. Standard deviations in parentheses.

Table A2

Regression: Specification test of the value-added model, equation (3)

	Test score 8th grade		Test score 9th grade		Test score 9th grade	
	Reading	Math	Reading	Math	Reading	Math
Test score 5th grade	0.632**	0.728**			0.580**	0.704**
	(0.004)	(0.003)			(0.004)	(0.003)
Test score 8th grade			0.683**	0.809**		
			(0.003)	(0.003)		
Non-intact in	-0.057**	-0.093**	-0.060**	-0.054**	-0.091**	-0.116**
5th grade	(0.008)	(0.007)	(0.007)	(0.006)	(0.008)	(0.008)
Dissolution between	-0.054**	-0.110**	-0.032*	0.001	-0.064**	-0.081**
5th and 8th grade	(0.015)	(0.014)	(0.014)	(0.012)	(0.015)	(0.014)
Dissolution between	-0.046+	-0.096**	-0.056*	-0.042*	-0.087**	-0.115**
8th and 9th grade	(0.026)	(0.024)	(0.022)	(0.020)	(0.026)	(0.024)
R^2	0.5101	0.6004	0.5803	0.7190	0.4845	0.5830
N	43 883	43 883	43 883	43 883	43 883	43 883

Note. Controls for student and family characteristics and time dummies are included. Standard errors clustered at the family level. $+ p<0.10$. $*p < .05$. $**p < .01$.

Tables

Table 1
Descriptive Statistics: Family structures

		Percent			
Family category		Total sample	5th grade	8th grade	9th grade
1	Parents married	60.93	61.48	60.85	59.78
2	Parents cohabiting	12.43	14.69	10.98	10.52
3	Single mother	13.98	13.38	14.27	14.72
4	Mother and stepfather	8.08	6.76	8.89	9.28
5	Single father	3.20	2.69	3.44	3.88
6	Father and stepmother	1.38	1.00	1.57	1.82
	Intact family (categories 1 and 2)	73.36	76.17	71.83	70.30
	N	598 029	246 521	250 440	101 068

Table 2

Descriptive Statistics. Test Scores in 5th Grade 2007 across Family Structures

	Dissolution prior to 5th grade			Dissolution between 5th and 8th grade			Dissolution between 8th and 9th grade		
	Reading	Math	N	Reading	Math	N	Reading	Math	N
Intact	0.075 (0.986)	0.094 (0.971)	38 740	0.098 (0.975)	0.123 (0.956)	33 521	0.109 (0.970)	0.139 (0.948)	30 942
Family dissolution	-0.103 (0.998)	-0.132 (0.998)	12 508	0.010 (1.001)	0.000 (0.964)	2 327	0.078 (0.998)	0.069 (0.998)	709
P-value difference	0.000	0.000		0.000	0.000		0.391	0.053	

Note. The test scores are standardized with mean 0 and standard deviation 1. 'Intact' indicates families with both biological parents present, 'Family dissolution' indicates that the family goes through a dissolution in the year/during the years indicated in the top row of the columns. Standard deviations in parentheses.

Table 3

Descriptive Statistics. Background Characteristics across Family Structures
Regression: Dependent variable: Intact Family

Variables	Descriptive statistics		Regression
	Intact family	Non-intact family	Dep. variable: Intact family
Individual characteristics			
Birth order	1.936 (1.003)	1.822 (0.937)	0.004** (0.001)
Male	0.509	0.503	0.004* (0.001)
First generation immigrant	0.014	0.006	0.181** (0.007)
Second generation immigrant	0.042	0.023	0.136** (0.004)
Parental characteristics			
Father			
Age	44.454 (5.767)	42.887 (6.363)	0.000 (0.000)
Work income after taxes	43.443 (42.696)	35.542 (30.291)	0.001** (0.000)
Education/highest attained degree:			
Mandatory	0.222	0.352	
High school	0.414	0.419	0.094** (0.002)
College, up to BA	0.240	0.168	0.120** (0.003)
College, MA and PhD	0.123	0.061	0.139** (0.004)
Mother			
Age	41.760 (4.972)	39.848 (5.423)	0.013** (0.000)
Work income after taxes	28.224 (15.732)	31.472 (12.944)	-0.004** (0.000)
Education/highest attained degree:			
Mandatory	0.238	0.320	
High school	0.312	0.348	0.055** (0.003)
College, up to BA	0.371	0.286	0.099** (0.004)
College, MA and PhD	0.080	0.046	0.142** (0.008)
R^2			0.0777
N	438 706	159 323	598 029

Note. The first two columns report descriptive statistics of individual and family characteristics in intact and non-intact families. Standard deviations in parentheses. The third column presents the regression results, with standard errors in parentheses. The dependent variable is a dummy indicating family intactness. Mandatory education is reference category among the dummies indicating parental education. Year dummies are included. Standard errors clustered at the family level. $*p < .05$. $**p < .01$.

Table 4
Regression. Dependent variable: Test Score National Tests

	Test Score Reading			Test Score Mathematics		
	(1)	(2)	(3)	(4)	(5)	(6)
Intact family	0.194**	0.045**	0.087**	0.256**	0.119**	0.100**
	(0.004)	(0.008)	(0.015)	(0.004)	(0.008)	(0.015)
Birth order		-0.120**	-0.144**		-0.083**	-0.090**
		(0.003)	(0.006)		(0.003)	(0.006)
Birth order x Intact		0.017**	-0.029**		0.010*	-0.033**
		(0.004)	(0.006)		(0.004)	(0.006)
Family Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.0077	0.1486		0.0131	0.1397	
N	598 029	598 029	598 029	598 029	598 029	598 029

Note. Controls for student and family characteristics and year dummies are included. Parental education is included as a continuous variable ranging between 1 and 8. Standard errors are clustered at the family level. *$p < .05$. **$p < .01$.

Table 5
Regression. Dependent variable: Test Scores National Tests in
Advance of the Divorce (5th Grade 2007)

	Families divorcing between 5th and 8th grade		Families divorcing between 8th and 9th grade	
	Reading	Math	Reading	Math
Upcoming divorce	-0.036+	-0.079**	0.000	-0-034
	(0.021)	(0.020)	(0.034)	(0.034)
Family Fixed Effects	No	No	No	No
R^2	0.1192	0.1092	0.1178	0.1066
N	35 848	35 848	31 651	31 651

Note. Controls for student and family characteristics and year dummies are included. Standard errors clustered at the family level. +$p<0.10$. *$p < .05$. **$p < .01$.

Table 6

Regression. Dependent variable: Value-Added Test Scores National Tests

	Test score progression 5th-8th grade		Test score progression 8th-9th grade		Test score progression 5th-9th grade	
	Reading	Math	Reading	Math	Reading	Math
	(1)	(2)	(3)	(4)	(5)	(6)
Non-intact family	-0.037**	-0.062**	-0.031**	-0.020**	-0.068**	-0.082**
in 5th grade	(0.009)	(0.008)	(0.008)	(0.007)	(0.009)	(0.008)
Divorce between	-0.042*	-0.091**	-0.009	0.032*	-0.051**	-0.060**
5th and 8th grade (D1)	(0.017)	(0.015)	(0.015)	(0.012)	(0.018)	(0.015)
Divorce between	-0.045	-0.086**	-0.041+	-0.018	-0.086**	-0.105**
8th and 9th grade (D2)	(0.029)	(0.026)	(0.024)	(0.021)	(0.030)	(0.026)
R^2	0.0032	0.0115	0.0046	0.0013	0.0078	0.0106
N	43 883	43 883	43 883	43 883	43 883	43 883

Note. Controls for student and family characteristics and year dummies are included. Standard errors clustered at the family level. $+p<0.10$ $*p < .05$. $**p < .01$.