Does Quality Time Produce Quality Children?

Evidence on the Intergenerational Transmission of Human Capital using Parental Deaths*

ERIC D. GOULD
HEBREW UNIVERSITY, CEPR, AND IZA

AVI SIMHON
HEBREW UNIVERSITY

June 12, 2011

Abstract: This paper uses variation created by parental deaths in the amount of time children spend with each parent to examine whether the parent-child correlation in schooling outcomes stems from a causal relationship. Using a large sample of Israeli children who lost one parent during childhood, we find a series of striking patterns which show that the relationship is largely causal. Relative to children who did not lose a parent, the education of the deceased parent is less important in determining child outcomes, while the education of the surviving parent becomes a stronger factor. Moreover, within the group of families that lost a parent, this pattern intensifies when a child loses a parent earlier in life – the education of the deceased parent becomes even less important, while the effect of the surviving parent's schooling intensifies. These results provide strong evidence that there is a causal connection between parent and child schooling, which is dependent on the child's interaction time with each parent. These findings help us understand why educated parents typically spend more time with their children – they are more effective in producing human capital in their children.

Key Words: intergenerational mobility, education

JEL Codes: I21, J13, J24

* We thank Saul Lach, Dan Hamermesh, Josh Angrist, Victor Lavy, Bruce Weinberg, Guy Stecklov, Omer Moav, and seminar participants at Hebrew University, Tel Aviv University, and the Israel Economic Association for helpful discussions. Avi Simhon thanks the Israel Science Foundation for research support.

I. Introduction

It is well known that there is a positive correlation between the education levels of parents and their children. It is less clear whether this relationship is due to genetic factors or whether education causes parents to be more effective in the formation of their children's human capital. Pinning down the role of nature versus nurture has many policy implications regarding how, and even if it is possible, to create a more equal distribution of opportunities across children from heterogeneous backgrounds. If there is no mobility and the relationship is merely a correlation due to shared genetics, policy interventions to equate opportunities may be ineffective. If the relationship is causal, a larger scope of policy interventions to improve educational outcomes may be successful in equaling the playing field of child opportunities. This is particularly true since education likely affects non-wage outcomes such as health, fertility, crime, and marital success.[1]

Although there is a large literature on this issue, particularly in the last decade which focuses on establishing causality, there exist large differences in the findings across methodologies. This paper utilizes a new approach based on the idea that the amount of learning from a parent should be a function of how much time a child spends with each parent. Examining this issue empirically is problematic, since the time spent with each parent is likely to be endogenously determined by the bargaining power and labor force participation of both parents, as well as being correlated with unmeasured characteristics of the child and parents. For example, a child with learning problems may receive more attention from his/her parents, thus leading to a negative correlation between child outcomes and parental time inputs.

To overcome these empirical obstacles, we exploit variation in the time spent with each parent that comes from the tragic loss of one parent. Our sample is composed of all

[1] Black and Devereux (2010) outline three mechanisms for a direct effect of parental education on children's human capital. First, education of the parents affects their income, and income could affect investments in human capital, particularly in the presence of credit constraints. Second, education could affect the productivity of parents in creating their children's human capital, or their time-allocation to child care activities. Third, education could affect the bargaining power of the wife versus the husband, which may alter the amount of household resources being allocated towards childcare. In addition, parental education could affect a child's human capital by affecting the child's health (Currie and Moretti (2003)).

individuals born in Israel between 1974 and 1986 who lost a mother or father (but not both) during their childhood or early adulthood. Our sample size is quite large, including over 22,000 children who lost a parent before the age of 18. Our outcome variable of interest is whether the child passes the "matriculation exam" in Israel by the end of high school, which is achieved by roughly 55 percent of Israeli students, and is required to attend college. Since this important outcome is measured at the age of 18, we have several sources of identifying information at our disposal. Specifically, our analysis compares the intergenerational transmission of schooling across the following samples: (1) children that did not lose either parent; (2) children that lost a mother or a father before the age of 18; and (3) children that lost a mother or a father, but after the matriculation exam was completed (after age 18). Using variation across these groups, we test the idea that if education causes parents to be more effective in producing educated children, the relationship between a parent's education and his/her child's human capital should depend on whether that parent was alive and able to interact with the child.

The loss of a parent is obviously one of the most traumatic events a child might endure, and the incidence of such an event is not completely random. For example, children who suffer a parental loss generally come from a lower socio-economic background. Our analysis addresses this issue by exploiting how many years a child spends with the parent who eventually dies. Specifically, we take a sample of children who are similar in the sense of having suffered the death of the same parent before the age of 18, and examine whether the parent-child relationship in education intensifies with the number of years together before the parent dies. Furthermore, we exploit the discontinuity introduced by the timing of the test relative to the parental death. Within a sample of individuals that lost a given parent, losing a parent after the age of 18 should not affect the outcome of a test which was completed by the age of 18, while losing a parent before the age of 18 could have a large impact on the same test. This discontinuity allows us to perform a useful placebo analysis in order to examine the causal interpretation of our estimates.

Our results display a consistent, striking pattern which indicates that parental education has a large causal impact on the human capital of children, and the size of the impact depends on the amount of time a child spends with each parent. If a mother dies, her education becomes less important for the child's educational outcome, while at the same time, the father's education becomes more important. If a father dies, the reverse happens – the father's education becomes less important while the mother's education plays a larger role. Importantly, these relationships intensify when the parent dies when the child is younger. That is, the effect of a father's education decreases with the amount of years the child spends with a mother that eventually dies, while the effect of the mother's education increases with each year that she remains alive. A similar pattern, in reverse, occurs when the father dies – the education of the father (mother) becomes more (less) relevant for the child as the number of years spent with the father increase.

Our placebo analysis shows that the parent-child relationship in schooling does not depend on the child's age at the time of parental death if the death occurs after the matriculation exam was completed (in 12^{th} grade). In fact, the parent-child correlation in schooling outcomes for those that lost a parent after the exam was taken is virtually identical to those that did not lose a parent at all. This finding suggests that our main results regarding those that lost a parent before the test was taken are not due to the non-random selection of families that suffer a parental death.

The "causal" interpretation of our estimates is further supported by the stark pattern that the importance of each parent moves in opposite directions, and flip signs (still in opposite directions), depending on whether it is the father or mother that dies. Families that lose either parent are similar in terms of their observable characteristics, such as the tendency to come from a lower socio-economic background. Therefore, if both types of families are similar in terms of their unobservable characteristics as well, we would not expect the unobserved factors to be correlated in one direction with the mother's education and in the opposite direction with the father's education if the mother dies, and then for each correlation to reverse itself if the father dies. Overall, the sharp contrast in the results for maternal versus paternal deaths provides strong evidence that the amount of parent-child interaction time is driving our results, and not other

environmental factors which are likely to be correlated in the same direction with the education levels of both parents.

We perform a series of robustness checks and extensions which show that our findings are not sensitive to controlling for parental income or school fixed-effects. In addition, the results are similar after controlling for twenty different causes of death, or if the sample is restricted to children that lost a parent only due to cancer (which is the most common cause of parental death in our sample). These findings should allay concerns that our results are due to differences in the types of parental death that are likely to affect children at different ages.

We also find that the results become a bit larger for families where the surviving parent did not remarry. This finding lends further support that the relationship is casual, since the adverse effect of losing a parent can be mitigated when the surviving parent "replaces" the deceased spouse by remarrying. Interestingly, we find some evidence that a mother's education is more important for verbal skills versus math skills. Also, we find that the education of both parents affects daughters much more than sons, which is consistent with recent evidence that girls are more affected by their childhood environment relative to boys (Kling, Liebman, and Katz (2007) and Gould, Lavy, and Paserman (2011)).

As indicated above, the intergenerational transmission of human capital has received a lot of attention in recent years. We review the literature extensively in the next section, but recent papers generally employ one of two strategies: (i) using twin parents or adopted children to control for the genetic transmission of human capital; or (ii) using an instrument for parental education (such as changes in compulsory schooling laws). The results tend to differ across methods, but overall, the estimates reveal small causal effects of parental education on child schooling levels. However, there is stronger evidence that parental education affects other academic outcomes like schooling retention and test scores.

Our contribution is to introduce a new empirical strategy which uses information on parental deaths, and our findings support those of recent papers which find strong

effects of parental education on child test scores. Moreover, since we show that the effect of parental education depends on the amount of time spent together with their children, our results shed light on recent evidence that better educated parents spend more time with their children than less educated parents. Guryan, Hurst, and Kearney (2008) show that parental education is negatively related to the amount of time spent on non-child related home and leisure activities, presumably in response to a higher opportunity cost of time. However, in contrast, the amount of time spent with children increases with education, despite the higher opportunity costs of time. Guryan, Hurst, and Kearney (2008) raise this as a puzzle, deserving of more attention in future research. Our paper can help understand this puzzle, since educated parents seem to be more productive in their time with children, and therefore, respond to their higher productivity by spending more quality time with their children.

II. Literature

There is a large literature examining the intergeneration transmission of human capital. However, untangling whether the strong correlation between parents and children in their education levels is due to genetics, or whether there is a causal relationship, has proved to be a difficult task. Three main strategies have emerged to separate nature versus nurture: (1) exploiting variation in education levels across parents who are identical twins in order to control for their genetic and family background; (2) using data on adopted children to control for the genetic transmission of human capital from parents to children; and (3) using an instrument for parental education levels. Excellent summaries of the literature are presented in Black and Devereux (2010) and Holmlund, Lindahl, and Plug (2010).[2] As they discuss in detail, each strategy has its merits and potential weaknesses.

Behrman and Rosenzweig (2002) employed the first strategy mentioned above and found that OLS estimates of the effect of parental schooling on child schooling are

[2] See Haveman and Wolfe (1995) for a review of the literature on family background and children's performance.

roughly equal for mothers and fathers (entering both reduces the estimate of each one alone by about 50 percent). However, after differencing out the common component between twin parents, the effect of a mother's education is found to be zero, while the father's education remains positive and significant. The authors suggest that "this pattern of results is consistent with the hypothesis that women's time in the home is a critical determinant of the human capital of children" since educated women work more, and therefore, the effect of maternal education on her children in the twin analysis may be confounded by the correlation between mother's education and labor force participation.

In general, using twins to identify the causal effect of parental education on children hinges on the assumption that the differences in education levels across twins are uncorrelated with differences in any other factor which affects their children's schooling. This assumption may not hold if the education of each twin is correlated with the characteristics of the twin's spouse, which in turn may affect the education level of the child. In contrast to this strand of the literature, our identification strategy is not based on exploiting differences in the education levels of parents across families, but rather differences in the amount of time spent with each parent, conditional on the education levels of both parents. In this manner, we directly investigate the conjecture by Behrman and Rosenzweig (2002) that a parent's time with children is critical for developing a child's human capital.

The second main strategy in the literature is to control for the genetic transmission of human capital by using data on adopted children. Examples include Plug and Vijverberg (2003), Plug (2004), and Bjorklund et al. (2006). The latter study is unique for having information on both the biological and adoptive parents. These papers tend to find stronger causal effects for the schooling of the father versus the mother on a child's education level. But, the assignment of adopted children to families is not typically random. Sacerdote (2007) analyzes a sample of Korean-American adoptees which are arguably randomly assigned to parents. He finds that regressing mother's education on her child's schooling yields a coefficient three times larger for non-adopted children versus adopted children, which suggests that most of the intergenerational correlation in education is not due to nurture. These findings are roughly in line with the other studies

mentioned above. However, Sacerdote (2007) finds that the parental education of adopted children has larger effects on the type of college attended and other social outcomes like drinking behavior.

The main advantage of using adoptees is the ability to control for shared genetics between parents and children, although generalizing the results from studies using adoptions may be problematic if the adoption process itself creates special problems for the child. Emotional and social problems associated with being an adopted child may affect the transmission of human capital from parent to child. Our study is not affected by this specific issue, but since we are using variation created by parental deaths, we do need to consider that a parental death is obviously a very traumatic episode for a child. Our analysis controls for this by exploiting variation in the timing of the parental death, and focusing not on the effect of a parental death itself, but rather on the interaction between the age of the child when he/she lost a parent and each parent's education level.

As indicated previously, another typical problem in the adoption studies is that the assignment of adopted children to parents is often not random. But, even when the assignment is arguably random (Sacerdote (2007)), the randomization is not on parental education alone, so that parental schooling levels of adopted children are correlated with other characteristics of the parents, neighborhoods, and schools. In light of this, adoption studies tend to focus more on the overall breakdown of the nature versus nurture components, rather than trying to parcel out the precise mechanisms. For example, Sacerdote (2007) does not even try to separate the effect of the mother's education from the father's, and like the rest of the literature, does not shed light on the mechanisms underlying a causal relationship between a child and his/her environment.

Our analysis cannot control for everything that may be correlated with parental education, although our results are robust to controlling for parental income, school fixed-effects, and the cause of death. However, it seems very unlikely that our results are driven by unobserved conditions of the childhood environment and not the parents themselves. This is based on our finding that role of mothers and fathers are of opposite signs when one parent dies, and then flip signs (still in opposite directions) when the other parent dies. This pattern strongly suggests that the amount of parent-child

interaction time is driving our results, and not other environmental factors which are typically correlated in the same direction with the education levels of both parents. As such, our findings shed light on the relevant mechanisms by revealing the importance of the interaction between parents and children for scholastic outcomes.

The third approach in the literature is to find an instrumental variable which is correlated with parental schooling levels, but not with other factors which affect a child's education. Black, Devereux, and Salvanes (2005) use the increase in compulsory schooling in Norway from seventh to ninth grade during the 1960's, and find little evidence for a causal relationship between parent and child schooling, although their estimates appear to be more significant for maternal schooling when the sample is restricted to parents with lower levels of education. Oreopoulos, Page, and Stevens (2006) use a similar strategy with US data and find significant and large effects on grade repetition.

Maurin and McNally (2008) exploit exogenous variation created by the easing of the college entrance exam requirements in the aftermath of the May 1968 student riots in France, and show that the subsequent increase in college attendance was transferred to the next generation by lowering grade repetition. Carneiro, Meghir, and Parey (2007) use variation in schooling costs at the time the mother was growing up to show that maternal education increases child math scores and lowers behavioral problems.

The advantage of the IV strategy is that it differentiates the effect of parental education from other factors which may be correlated with parental characteristics. The disadvantage is that IV estimates often provide imprecise estimates, and as Black and Devereaux (2010) point out, the IV exclusion restriction cannot be tested and may be violated. For example, changes in compulsory schooling laws could be accompanied by other changes in the school system, such as changes in budgets, class size, curriculums, the hiring of new teachers, new buildings, etc.

Overall, the results from the twins and adoptees studies point to a small, but significant effect of father's education, and no effect of a mother's education.[3] The IV findings point to a small effect of the mother but not the father on child schooling levels, but stronger effects on other outcomes like test scores and grade retention. Although the variation in the results in the literature could be due to differences in the time period and country used in the analysis, recent studies which apply each method to the same data show that the variation in results is largely due to the methods, not the data (Holmlund et al. (2010) and Haegeland et al. (2010)). These papers suggest that different methods produce different results because each method is using variation in a different part of the parental education distribution. For example, IV studies using compulsory schooling laws are using variation in the 7^{th} to 9^{th} grade part of the distribution, while adoptive parents tend to come from the higher end of the distribution. If the effect of parental education on child schooling is non-linear, then using different parts of the education distribution could yield different results.

Our main contribution is to introduce a new empirical strategy, using parental deaths, to investigate the causal effect of parental education on the human capital of their children. Our estimates are much larger than most of the literature which measures child outcomes with their completed schooling levels. However, our findings are similar to studies which yield very significant effects on children's test scores and grade repetition. In addition, our analysis supports the idea that the differences in the findings within the existing literature are due to each method using different parts of the parental education distribution. We find much stronger effects of parental education from the lower part of the distribution, which is consistent with the idea that the IV results are larger than the twins/adoptee findings because the former is shocking the lower part of the parental education distribution while the twin/adoptee strategy is using variation from the upper tail.

[3] These results are similar to those in the fourth strategy in the literature, which is to use a structural approach. Belzil and Hansen (2003) find a negative effect of a mother's education on her children, while a father's education has a positive effect.

Our analysis is also related to the literature on the general effect of parental death on child outcomes.[4] For example, Lang and Zagorsky (2001) use variation created by parental deaths and divorce to show that growing up in a single parent household does not affect children, after controlling for a rich set of background characteristics.[5] Chen et al. (2009) find that losing a mother significantly hurts a child's enrollment rate in college, while a father's death has no effect. Adda et al. (2011) use Swedish data to show that parental death has a significant, but small, effect on child schooling and other outcomes. None of these papers use parental deaths to focus on the intergenerational correlation of human capital, although Adda et al. (2011) mention in their conclusion that the correlation seems to decline when a parent dies. Therefore, we are the first to extensively analyze how the effect of a parental death varies with the education level of each parent and the age of the child when a parent dies. Our findings contribute to the literature on the effect of parental death by confirming that the average effect is minimal. However, we show that the small average effect is masking something quite interesting -- the loss of a parent is much more detrimental when the parent is educated and when the child is younger at the time of the loss, but the adverse effect of the loss is mitigated by a higher level of education for the surviving parent.

Finally, our analysis sheds light on the important findings of Guryan, Hurst, and Kearney (2008) that show how the time allocation of parents for child activities varies with parental education.[6] Specifically, they show that educated women spend much more time with their children than less educated women, despite having a higher cost of time and higher employment rates.[7] This pattern holds across several countries, and persists even after controlling for labor force participation. For working men, a strong, positive relationship is also found between education and each category of childcare.[8] For

[4] See Corak (2001), Lang and Zagorsky (2001), Gertler, Levine, and Ames (2004), Case, Paxson, and Ableidinger (2004), and Case and Ardington (2006).
[5] Similar findings are found in Corak (2001) who focuses on the effects of divorce on children.
[6] Kimmel and Connelly (2007) find similar results regarding the relationship between time with children and parental wages.
[7] Guryan, Hurst, and Kearney (2008) write that "working women with a college degree spend 70 percent more time in child care than their counterparts with less than a high school degree, and the education gradient is even stronger in recreational child care."
[8] Guryan, Hurst, and Kearney (2008) show that mothers spend roughly double the amount of time on child care than fathers, and this is true when comparing working mothers to working fathers. However, men spend a larger proportion of their time with children doing recreational activities.

example, college-educated men in the labor force spend more than 100 percent more time on all types of childcare activities than less-educated men. In general, educated parents have higher opportunity costs of time, and this leads them to reduce their time allocation to non-market related activities. As a result, we would expect parental education to reduce their time investments in children as well, but since the opposite occurs, Guryan, Hurst, and Kearney (2008) suggest that a "possible explanation for the educational gradient in child care points to the question of whether parental time investments in children are correlated with increased child human capital, and whether this relationship is stronger for more-educated parents."[9]

Our analysis provides convincing evidence that this is the case. In general, examining this issue empirically is difficult due to the lack of data and by the endogeneity of parental time inputs with the characteristics of the child. For example, some parents may spend a lot of time with their children because they have difficulties doing their homework, which may lead to a negative correlation between parental time and child outcomes. Parents may enjoy spending time with children who are more successful from a social and academic perspective, thus leading to a positive correlation between parental time and child schooling.

Very few papers have even examined this issue empirically. Datcher-Loury (1988) provides evidence that time investments of well-educated mothers raise child schooling, but time investments by less-educated mothers appear to be ineffective. However, Datcher-Loury (1988) uses PSID data which does not have information on the actual time invested in childcare activities. Instead, time spent on childcare is estimated using information on total housework time, hours worked in the labor force, and number of children. The analysis in Datcher-Loury (1988) does not address the endogeneity of parental time investments, and does not consider the time investments of fathers. Not considering the time investments of the father may bias the coefficient on mother's time, since the time allocation of both parents is likely to be endogenously determined with the

[9] This issue dates back to the work of Leibowitz (1974a, 1974b, 1977), which showed that child care time is positively correlated with socioeconomic status, and that the reported time a parent spent with a child was positively correlated with the IQ of boys but not girls, but was not associated with higher schooling after controlling for IQ. Coleman (1988) also argued that a parent's level of education would influence a child less if the parent does not interact with the child.

labor force participation of the wife and husband. For example, the extra time spent on childcare by a parent who does not work may come at the expense of time spent by the spouse who specializes in market work. If this is the case, additional time by a parent with his/her children may not appear to be very effective, when in fact it may be effective, but simply negatively correlated with the spouse's time inputs.

By using a credibly exogenous measure of time inputs (the number of years spent with each parent due to the death of one of them), our analysis shows that education makes mothers and fathers more effective in producing human capital in their children. This finding contributes not only to the literature on whether parental education increases child outcomes, but also sheds light on the mechanisms by highlighting the importance of the interaction time between the child and each parent. Finally, it helps us understand why educated parents spend more time with their children when they reduce time spent on all other non-market activities – education makes their time with their children more productive.

III. Data

Our analysis uses data from the official Population Registry of Israel and the Ministry of Education. Every citizen of Israel has a record in the Registry with his or her name, identity number, immigrant status, date of birth, date of expiration, marital status, and the identity number of each parent. This information was used to ascertain the number of siblings for each person and their birth order. We received information on the death date of individuals as of March 2005.

These demographic variables were matched to the student-level data provided by the Ministry of Education, which contain information on each student's performance on the various subjects (math, Hebrew, English, bible studies, science, etc.) which compose the matriculation exam taken during the 11^{th} and 12^{th} grade. We received this data for all high school students scheduled to graduate between 1992 and 2004 (born between 1974 and 1986), as well as information on each student's gender, immigrant status, education levels of both parents, and an indicator for the specific high school attended (without

revealing the name or location of the school). We restricted the sample to native-born Jews who are not ultra-orthodox because of data reliability.

Table 1 provides descriptive statistics. The first two columns present the sample used in our analysis of maternal loss, by comparing the means of the variables for those that did not lose a mother to those that did lose a mother. It is worth noting the size of the samples used in our analysis – the data contain 12,742 children who lost a mother and 275,784 children who did not lose either parent before the age of 18. Table 1 shows that the passing rate of the matriculation exam is only 53% for those who did not lose a parent, and slightly lower for those that lost a mother (50%). These numbers show that passing the matriculation exam is an important milestone which has a lot of variation. Conditioning on those that did not drop out before 12^{th} grade (this sample will be used in our analysis for robustness checks), the passing rate rises to 56% overall and 53% for those that lost a mother. Therefore, the low overall passing rate is not due to a large number of students dropping out before 12^{th} grade – which stands at 6 percent in this sample.

The first two columns in Table 1 present evidence that losing a mother is not an exogenous event, since it appears to be correlated with family background characteristics. Families that suffered a maternal loss have lower education levels for both parents and lower income levels (except for the father). These differences are not dramatic, but they could possibly explain why children who lost a mother had a lower matriculation rate, without there being any causal effect of the death on the child's performance. However, our focus is not to explain this difference, but rather to examine how the relationship between parental and child schooling changes when a parent dies, and how this varies with the age of the child when the parent died.

The last two columns of Table 1 present the means for the samples used in our analysis of paternal death. Again, the samples are large. The incidence of losing a father is almost three times larger than losing a mother, which stems from the fact that fathers tend to be older than mothers, and women tend to live longer than men. As a result, there are 33,132 individuals in our sample that lost a father versus 12,742 that lost a mother. However, losing a father seems to be less random than losing a mother. The means of the

sample that lost a mother are closer to those that did not lose a mother, relative to a similar comparison using paternal deaths. For example, the gap in the matriculation rate is about 3% for those that lost a mother and over 8% for those that lost a father. The gap in parental education rates is less than half a year for those that lost a mother, but about a year for those that lost a father. However, as noted above, our strategy utilizes not only information on those that lost a parent versus those that did not, but also variation within those that lost a parent based on the age of the child at the time of parental death. In addition, we exploit the discontinuity introduced by whether the parental death occurred when the child was below or above the age when the test was completed. Moreover, analyzing the death of each parent individually provides a useful robustness check – the effect of being with a parent should be the mirror effect of losing that particular parent.

Table 2 presents a preliminary analysis of our data. The first six columns use a sample of students who did not lose either parent. A dummy variable for the student passing the matriculation exam by the end of 12^{th} grade is regressed using OLS on our core set of control variables: education levels of both parents, ages of both parents when the child was born, number of siblings, a dummy for being male, a dummy for each cohort, and a dummy for each birth order placement. The first two columns show that entering the education level of one parent but not the other yields coefficients which are very significant, but most likely biased due to assortative matching in the marriage market. This can be seen by the reduction, by almost a half, in the coefficient on either parent's education when the education levels of both parents are included in the third column. Behrman and Rosenzweig (2002) found a similar pattern using data from the United States, which shows that our Israeli data is similar to other studies.

The results in the third column of Table 2 suggest that the estimated effect of the mother's education is slightly larger, but essentially equal to the effect of the father's education. The magnitudes are quite large – an additional two years of schooling for either parent increases the passing rate by about 5 percentage points, which is almost 10 percent of the overall passing rate. We now examine whether these coefficients are sensitive to the inclusion of other control variables, like school fixed-effects and parental wages. Unfortunately, we cannot include school fixed-effects for students who dropped

out before 12th grade, since the school indicator in our data is for the school attended in 12th grade. Therefore, to add school fixed-effects, we need to restrict the sample to students who did not dropout before 12th grade (Table 1 shows that about 6 percent drop out before 12th grade). A change in the results with school fixed-effects could potentially be due to the change in the sample, rather than the inclusion of school effects. Therefore, Table 2 shows the results after making the change in the sample, and then adds school fixed-effects to the specification.

Comparing column (4) to column (3), the results are nearly identical when the sample is restricted to those that did not drop out before 12th grade. However, the next column shows that the coefficients on both parents' education levels are quite sensitive to the inclusion of school fixed-effects. Each coefficient is reduced by about 0.005, which represents roughly 20 percent of the coefficient on the schooling level of each parent. Adding parental wages in column (6) reduces the coefficients further, but not very much. The main finding from this exercise is that the coefficients on the education levels of both parents are quite sensitive to the inclusion of school fixed-effects, but not to the change in the sample required to use school fixed-effects and not to the addition of parental wages to the specification.

Columns (7) to (9) in Table 2 present regressions for only those students who lost a mother before the age of 18 (and not a father before the age of 18). The next three columns perform a similar analysis for those that lost a father, but not their mother, before the age of 18. In both cases, the estimated coefficient on each parent's education level is sensitive only to the inclusion of school-fixed effects, not to the change in sample required to include the school fixed-effects (excluding dropouts before 12th grade). However, a striking pattern emerges when comparing these results to those in the first six columns. For individuals that lost a mother before the age of 18, the estimated coefficient on the mother's education is about 25 percent smaller than the same specification for the sample that did not suffer a parental death (columns (3), (4), and (5) versus columns (7), (8), or (9) respectively). At the same time, the estimated coefficient on the father's education is about 20 percent larger.

But, comparing the results for those that lost a father to those that did not lose either parent produces the opposite pattern. The coefficient on the mother's education increases by more than 25%, while the coefficient on the father's education declines by a similar amount. For example, the coefficient for the mother's education level is roughly equal to the father's education for those that did not lose either parent in column (3), but the mother's education is double the size of the father's education in column (10) for those that lost a father. Overall, the death of a parent apparently reduces the importance of that parent's education level, while increasing the importance of the surviving parent's education.

This pattern demonstrates one of the main points of the paper – the effect of a parent's education level on a child's schooling outcome depends on whether the child lived with that parent or not. This finding implies that the transmission of human capital from parents to children is not entirely genetic, and that children learn more from an educated parent. In addition, the results suggest that one parent's education level can substitute for the other's education, as the child spends more time with one parent versus the other. The rest of the paper investigates these patterns more extensively, and performs a series of robustness checks and a placebo analysis in order to support the causal interpretation of our findings.

IV. Analyzing Maternal Deaths

Main Analysis

Although our goal is to examine the intergenerational transmission of human capital, we first examine the direct effect of suffering a maternal death on a child's scholastic achievement. The first column in Table 3 uses a sample of individuals who lost a mother at some age (before or after the age of 18), and shows that those who lost a mother before the age of 18 had a 1.8 percent lower passing rate than those that lost a mother above the age of 18, after controlling for our core set of demographic variables (described above). This estimate is unchanged if we expand the sample to include

everyone who did not lose a father below the age of 18 in the second column. However, this estimate increases in size to –2.7 percent when school-fixed effects are introduced in columns (5) and (6).

These estimates indicate that losing a mother has a significant negative effect on the child's passing rate on the matriculation exam, but the magnitude is not large relative to the mean passing rate of 53 percent. However, our main goal is to see how this effect might vary with the education levels of the mother and father. To do this, the remaining columns in Table 3 include interactions between losing a mother before the age of 18 with the education level of each parent. These interaction coefficients indicate that the effect of a mother's education declines significantly if the child suffered a maternal death before the age of 18, and the effect of the father's education increases, but not significantly. These findings show that losing an educated mother is more costly than losing a less-educated mother, and that the effect of maternal education on her child's schooling seems to depend on the number of years spent with the child. However, the actual number of years spent together before the death is not interacted with parental education in Table 3.

Table 4 examines whether the importance of both parental education levels varies with the actual number of years spent with the mother before she dies (conditional on the loss taking place before the child reaches the age of 18). The first column of Table 4 uses a sample of only those that lost a mother before the age of 18, which controls for the non-random selection of families that suffer a maternal loss during childhood. The estimates indicate that every year spent with the mother increases the influence of a mother's education on her child's performance, but decreases the effect of the father's education. Interestingly, the estimated effect of a mother's education is essentially zero if she dies right after the child is born (the coefficient on the direct effect is –0.0029 and is not significant), but every additional year of life for the mother adds 0.0021 to the effect of her education on the child's passing rate. In contrast, the effect of the father's education on the child's passing rate is 0.0366 and very significant if the mother dies right after birth, but every additional year that the mother lives reduces significantly the effect of the father's education by 0.001. In other words, if the mother dies when the child is born,

her education has no effect on the child while the father's education has a big effect, but the effect of each parent moves towards one another as the child spends more time with both of them rather than just the father.

The remaining columns of Table 4 provide estimates of the same coefficients, but expand the sample to include those that suffered a maternal loss above the age of 18 and everyone else (excluding those that lost a father before age 18). The coefficients of interest are virtually identical, and once again suggest that the time spent with the mother raises the value of her education while reducing the value of the father's education. The last three columns of Table 4 reproduce the same analyses with each sample, but include school fixed-effects. To include school fixed-effects, the sample has to be restricted to those that did not drop-out before high school. Again, the coefficients of interest are very similar, which is notable because Table 2 showed that a naïve analysis which uses a sample of children that did not suffer a parental loss produces coefficients on parental education that are very sensitive to whether school fixed-effects are included in the specification or not. In contrast, the interaction coefficients of interest in Table 4 are not very sensitive to the inclusion of school fixed-effects, which lends credence to the causal interpretation of our estimates.

Table 5 investigates whether the results in Table 4 are due to the effect of parental education levels or to parental income levels. Information about parental income was obtained only for 1988, which requires us to condition our sample on those that did not lose a mother or father before 1988 in order to include the wage income of both parents in the specification. The first column of Table 5 presents the results in Table 4 after making only this change in the sample (deleting those that lost a mother or father before 1988). The coefficients of interest after this sample restriction are actually larger, with every year spent with the mother increasing the value of her education by 0.0035 (versus 0.0022 in Table 4), while decreasing the effect of paternal education by 0.0012 (versus 0.0010 in Table 4). The next column adds information on the wage income of both parents (with dummies for those that did not have any wage income), and a similar set of interactions between the child's age when the mother died and the income of both parents. However, the main interaction coefficients of interest regarding the parents'

education levels are still very similar (0.0032 versus 0.0035 for the mother, –0.0009 versus –0.0012 for the father). Similar patterns are found when the sample is restricted to only those that had positive income from both parents (the middle columns), and to specifications which include school fixed-effects (the last two columns).

Notably, the income levels of both parents tend to be highly significant and in the expected direction -- high income parents produce children with higher passing rates. But, the interaction coefficients between parental income and the child's age when the mother died do not display patterns that are similar to the interactions with parental education levels. Combined with our finding that the interaction coefficients with parental education levels are not sensitive to the inclusion of parental income, these results support the causal interpretation of our main coefficients of interest.

Further evidence that our main results are not spurious is presented in a placebo analysis in Table 6, which uses a sample of individuals who lost a mother after the matriculation exam is completed at the end of high school. If the results are similar for a sample of individuals whose passing rate could not be influenced by the future death of their mother, this pattern would suggest that our previous results are likely due to the selection of individuals based on unmeasured characteristics which are correlated with our variables of interest, rather than representing a causal relationship.

However, the results in Table 6 are not at all similar to those in previous tables. The interaction coefficients between each parent's education level and the age of the child when the mother died are not significant, and are the opposite signs of those in Table 4. These findings are robust to adding controls for the income of both parents and school fixed-effects. Furthermore, a comparison of the first two columns in Table 6 reveals that the overall parent-child correlation in schooling for those that lost a mother after the exam was taken is virtually identical to those that did not lose either parent. Losing a mother after the age of 18 apparently does not alter the relationship between the child's passing rate with either parent's schooling level. These findings show that our main results regarding those that lost a parent before the test was taken are not due to the non-random selection of families that suffer a maternal death, and thus lend strong support to the causal interpretation of the results.

The first two columns in Table 7 show that our main findings in Table 4 are virtually identical if the specification includes dummy variables for twenty different causes of death. The causes of death are described in Appendix Table 1, which shows that this information is missing for 14 percent of the children that lost a mother before the age of 18, while over 66 percent of the non-missing sample suffered a maternal death from cancer. No other cause of death is over 4 percent, so cancer is by far the most common cause of maternal death during childhood. We did not find any particular cause of death that can plausibly be considered exogenous, since each type of death is correlated with observable characteristics of the family. However, the fact that our results are completely unchanged after controlling for the cause of death indicates that our findings are not due to differences in the types of deaths suffered by children at different ages. This statement is further supported by the similarity of the results using only those that suffered a maternal loss due to cancer (column (3)) or because of other causes (column (4)).

It is worth noting that although losing a parent is undoubtedly a terrible and traumatic event for a child, our analysis addresses this issue in two ways. First, our results are robust to using a sample of only children who are similar in the sense that they all experienced the trauma of a parental loss. Second, all of the regressions control for the age of the child when the mother died. The coefficient on this variable tends to be negative and significant, but once the interactions with each parent's education level are considered, the effect of the child's age at the time of maternal death tends to be positive if the parents have at least 10 years of schooling. It is worth noting that our results are not sensitive to controlling linearly for the direct effect of the child's age at the time of parental death, or if we include dummies for each age (Appendix Table 2).

One possible alternative explanation for our results could be that the "trauma" associated with losing a parent at a given age depends directly on that parent's education level. However, it would also have to be the case that the trauma varies inversely with the surviving parent's education level, and not be based on the general socio-economic background of the family. Given that we find no such pattern regarding parental levels of

income, it seems unlikely that a child's trauma would display this kind of differential pattern regarding parental education levels.

Extensions

We now extend our analysis of maternal loss in several directions. First, we examine the issue of remarriage by the surviving parent. When a mother dies before the child reaches 18 years old, almost 20 percent of the fathers remarried before the child reached the age of 18. To see how this might affect our results, we restrict the sample to cases where the father did not remarry. As the left panel of Table 8 shows, this restriction does not reduce the size or significance of our main coefficients of interest. The interaction between the child's age when the mother died and maternal education actually increases from 0.0021 to 0.0030, while the interaction with paternal education remains at –0.0010. This pattern suggests that the phenomenon of remarriage, if anything, biases our main results towards zero. This finding is consistent with the idea that a mother who dies can be at least partially replaced with a second wife, and therefore, the negative effect of losing a mother can be mitigated by spending quality time with the new wife.[10] If the father does not remarry, the effect is more acute, since no one else can compensate for the loss of time spent with the mother other than the father.

So far, our dependent variable has been defined as whether the student passed the matriculation exam. However, some students do not even take the matriculation exam in Israel. In previous tables, we did not distinguish between those that fail and those that do not take the exam – both cases are defined as not passing the exam. In Table 9, we investigate whether the effect is coming from the probability of taking the exam or from the probability of passing the exam among the takers. The first column replicates our main findings using the whole sample, while the second column restricts the sample to those that took the exam. The main coefficients are slightly reduced in size – declining

[10] Our data contains only an indication that the surviving parent's marital status was changed after the spouse died. If the status did chance, this indicates that the surviving spouse did re-marry during the relevant time period. But, we do not have information on the new spouse, and we do not know if the new marriage lasted throughout the period.

from 0.0022 to 0.0019 for the interaction with the mother's education, and from –0.0010 to –0.0009 for the father's education. However, this reduction is quite small, and the coefficients are still significant. The third column uses a dummy variable for taking the exam as the dependent variable, and shows that there is somewhat of an effect on the probability of taking the exam – the interaction coefficient for the mother's education is particularly significant. In the last three columns of Table 9, similar findings are obtained after controlling for school fixed-effects. Overall, the results appear to be coming mainly from the probability of passing the exam among the takers, but there is some effect on the probability of taking the exam.

Table 10 examines the different components of the matriculation exam: math, Hebrew (the verbal section since Hebrew is the native language), Bible Studies, and English. The dependent variable in each regression is a dummy variable for achieving a score above 80 for each subject, or receiving a score above 70. Compared to our main results using the passing rate on the whole exam, the results in Table 10 are often similar to those obtained with both cutoff points, but they appear to be stronger in size and significance using the lower cutoff level. This pattern suggests that the effect is coming more from the marginal students who are on the brink of failing the exam, rather than the higher ability students not being able to achieve a high score due to the loss of their mother.

More importantly, the results for the overall matriculation rate are very similar to those obtained for receiving a score on Hebrew above 70, but much less significant for receiving a math score above 70. For example, the interaction of the child's age at maternal loss with maternal education is 0.0022 for the matriculation rate, 0.0021 for Hebrew, and 0.0013 for math (in the upper panel without school fixed-effects). The analogous interaction coefficients for the father's education are –0.0010 for the matriculation rate, –0.0011 for Hebrew above 70, and –0.0000 for math above 70. These patterns, which can also be seen in specifications which include school fixed-effects in the bottom panel, suggest that losing a mother has a greater effect on verbal scores than math scores.

As noted in Section II, one of the explanations for the variation in the findings of the existing literature is based on the idea that different identification strategies are using different parts of the parental education distribution. If this is the case, then different strategies will yield different results if the effect of parental education on child schooling is non-linear in parental education levels. Table 11 examines the hypothesis that the effect of parental education is heterogeneous, by running separate regressions for less-educated parents (less than 12 years of schooling) and for more educated parents (at least 12 years of schooling). The results in Table 11 are clearly much stronger for the less-educated mothers. This pattern holds for specifications with or without school fixed-effects, and also if we classify those with only 12 years of schooling in the less-educated category (not shown in the table). These findings are consistent with those in Table 10 which found stronger effects of maternal death on those near the passing cutoff point rather than those in the upper tail of the distribution. Overall, our analysis supports the idea that the effect is non-linear, and suggests that basic knowledge in parents is the critical factor in terms of imparting human capital onto children, rather than advanced knowledge obtained by higher degrees. However, if we examined an outcome for a more advanced level of education (such as receiving a BA degree or more), it is possible that higher levels of parental education could play a larger role.

Our final extension looks at whether the results differ between boys and girls. Table 12 presents a separate analysis for each gender, and shows that the loss of a mother has a strong impact on both boys and girls (see the coefficient on "mother died when child < 18"). However, the interaction coefficients of interest with parental education levels are dramatically larger for girls versus boys. For example, the interaction of the child's age at maternal death with maternal schooling is 0.0013 for boys and 0.0031 for girls. The analogous interaction for paternal education is 0.0002 for boys and -0.0020 for girls. These findings suggest that boys and girls are negatively affected by maternal loss, but the effect for girls depends much more on the education levels of both parents.

The idea that girls respond more to variation in their environments is supported by recent evidence. Kling, Liebman, and Katz (2007) found that being in a safer neighborhood had beneficial effects on education, risky behaviour, and health for girls,

but not for boys. Gould, Lavy, and Paserman (2011) found that girls are affected more than boys by the early childhood environment over the course of their lifetime across an array of social and economic outcomes. Therefore, our results contribute to the growing literature on the differences in the way boys and girls are influenced by their environment.

V. Analyzing Paternal Deaths

Main Analysis

This section analyzes the effect of parental education using paternal deaths instead of maternal deaths. The goal is to check the robustness of the main findings in the previous section, which showed that the importance of a parent's education in determining the child's education outcome depends on how much time the child spends with that parent alone versus both parents.

We start out by analyzing the average effect of suffering a paternal death on the matriculation rate. Table 13 shows that the average effect is not significantly different from zero – those that suffered the loss before the age of 18 had a similar matriculation rate to those that suffered the loss after twelfth grade. This finding, along with the negative average effect of losing a mother from the last section, is very similar to the results in Chen et al. (2009).

However, the lack of an aggregate effect masks the findings in Table 13 that the loss of a father affects the child in ways which depend on the education levels of the father and the mother. This can be seen by the positive and significant interaction between the mother's education with losing a father before the age of 18, and the significantly negative coefficient on a similar interaction with the father's education. Similar to the previous section, the table reveals that losing an educated parent hurts the child more, but the loss can be mitigated by higher levels of education for the surviving parent.

Table 14 extends the analysis by exploiting variation in the age of the child when the father dies, rather than using only the cut-off point at age 18. The estimates show that every year spent with the father increases the value of his education by a significant magnitude of 0.0007, while reducing the value of the mother's education by 0.0030. The latter coefficient is not significant (t-statistic equal to about 1.0), but there is a positive and significant direct effect of the mother's education when the father dies below the age of 18. That is, a father's death does increase the importance of the mother's education, but it does not significantly differ across the age level of the child at the time of paternal loss. These results are robust to using only those that suffered a paternal death before the age of 18, using anyone who suffered a paternal death at any age, or including all individuals in the sample that did not suffer a maternal death under the age of 18. In addition, controlling for school fixed-effects yields almost identical results.

Overall, the estimated coefficients of interest are the mirror image of each other in terms of their sign (and roughly the magnitude) relative to the analysis of maternal death. This is exactly what we would expect if the estimates are picking up a causal effect, since in both cases where either the mother or father died, the estimates are showing that the time spent with each parent increases the importance of that parent's education in the formation of human capital in their children. However, this is not what we would expect if the estimates are spuriously picking up unmeasured characteristics of the household and environment. Families that suffer a maternal death are similar to those that suffered a paternal death according to their observed characteristics – they both tend to be less educated and have lower income than the general population. If their unobserved characteristics are similar as well, this should generate similar coefficients regardless of whether the mother or the father died. This is especially true since the education of the mother and father are positively correlated, and thus, are likely to be correlated in the same direction with unobserved factors -- as they are with observed measures like socio-economic status. Our finding that the coefficients completely reverse sign (but with similar magnitudes) provides strong evidence that the results are driven by the child's interaction time with each parent, and not by a correlation between parental schooling and unmeasured characteristics of the childhood environment.

Table 7 shows that our main findings in Table 14 are similar if we control for the 20 different causes of death, or if we restrict the sample to those that suffered a paternal death due to cancer or non-cancer related issues. According to Appendix Table 1, the cause of death is missing for 18 percent of the sample of children who lost a father before the age of 18. However, although cancer is the most frequent cause of death for fathers (almost 30 percent of the non-missing sample) and strikes fathers more than mothers, heart-related deaths are also quite prevalent (almost 28 percent). We found that no cause of paternal death can be considered completely exogenous, since the incidence of each type of death seems to be correlated with observable characteristics of the family. However, the robustness of the results to the inclusion of controls for the cause of death indicates that our findings are not due to differences in the types of deaths suffered by children at different ages.

Extensions

Table 15 examines whether the estimates are sensitive to the inclusion of parental wages as control variables. To include wage income as of 1988, the sample is restricted to families that did not suffer any parental death before 1988. Table 15 shows that the coefficients of interest are somewhat less significant, but of similar magnitudes when the sample is restricted in this manner (the first column). The loss in precision is not surprising, since deleting observations that suffered a death before 1988 reduces the critical variation in the data (child's age when a father died) used to identify our coefficients of interest. (The mean year that a child suffered a death was 1992 with a standard error of 6.12 years.) In the second column, the addition of parental wages has no effect on the estimated coefficients of interest, although they are highly significant. Therefore, there is no evidence that the estimated coefficients of interest are picking up the effect of parental wages instead of education.

Table 16 performs the placebo analysis by using a sample of individuals who suffered a paternal death, but at an age where it should have no effect on their matriculation exam (after 12^{th} grade). The interaction of the child's age when the father

died with the father's education is not significant, while the analogous interaction with the mother's education is also insignificant. Notably, the direct effects of parental education levels on a child's passing rate are virtually identical to the general population (comparing the first to the second column). Relative to not losing either parent, losing a father above the age of 18 has no effect on the parent-child relationship in schooling. These findings lend further support to the causal nature of our estimates regarding those that lost a father below the age of 18.

To see whether the incidence of remarriage is influencing our results, the analysis is restricted to cases where the mother did not remarry in Table 8. The results are virtually identical to those using the entire sample of those that lost a father before the age of 18. In the maternal loss analysis, the results got stronger when we limited the sample to cases where the father did not remarry. In the paternal loss analysis, the results are unaffected by dropping cases where the mother remarried, most likely because the incidence of remarriage is much lower for widowed wives versus widowed husbands (5 percent versus 19 percent).

Table 17 examines whether the estimated effects on the matriculation rate are coming from the probability of taking the exam or the probability of passing the exam among the takers. Similar to the maternal loss analysis, the interaction coefficients of interest are similar in significance for the probability of taking the test and for the passing rate among those that took the test. However, the more dominant effect appears to be on the likelihood of passing the test for those that take it.

Table 18 investigates whether our main results are constant across subject areas, but using the grades on the different components of the matriculation exam as dependent variables. The interaction coefficients of interest are very similar for the main components of the exam, math and Hebrew. This differs from the maternal loss analysis, where the effect of losing a mother had a larger impact on Hebrew versus math. However, it is worth noting that losing a father is not completely symmetric to losing a mother, since mothers tend to do more child care than fathers when both are in the household. Guryan, Hurst, and Kearney (2008) show that working mothers spend roughly double the amount of time on child care than working fathers. Therefore, a

father likely has to increase his time with children when the mother dies more than a mother increases her time when the father dies. This difference could explain why the importance of the mother's education depends on whether the father dies, but not so much on the child's age when the father dies. In addition, it may explain why losing a mother has a differential impact on Hebrew, while losing a father has a more equal impact across subject areas.

Similar to the maternal loss analysis, the paternal loss findings are very different when we break down the sample according to gender and parental education levels. Table 11 shows that the intergenerational transmission of human capital is much greater at lower levels of parental education, which once again is consistent with a non-linear effect of parental education on a child's human capital. Table 19 shows that the death of a father has a much larger impact on girls versus boys. In both size and significance, all of the estimated coefficients of interest are much lower for boys relative to girls, which again supports the recent literature showing that the environment has a larger impact on girls.

VI. Conclusion

This paper uses variation created by parental deaths in order to identify the causal impact of parental education on the development of their children's human capital. Our analysis shows that a mother's death reduces the importance of her education in producing human capital in her children, but this reduction is less severe if the child was older at the time of her death. This finding is consistent with the idea that her education only matters if she spends time with her children. Regarding the father, his education increases in importance when the mother dies, but by a lesser amount if the child was older when the mother died. This pattern suggests that the father's education becomes more important when he spends more time with his children, in response to an earlier death of the mother.

Strikingly, the same patterns exist in reverse when the father dies. His education loses its importance, but at a declining rate if the child was older at the time of his death.

At the same time, the mother's education increases in importance, but at a declining (not significant) rate if the child was older when the father died. In addition, we find much larger effects on girls relative to boys. This finding contributes to the recent evidence that girls respond more than boys to changes in their environment.

We provide several pieces of evidence that these effects are reflecting a causal relationship. First, we show that the results are robust to restricting the analysis to only those that lost a parent below the age of 18, thereby exploiting variation only in the timing of the parental death within a sample that is similar in terms of everyone losing the same parent during childhood. Second, our findings are not sensitive to controlling for the cause of death, school fixed-effects, and parental income -- despite the fact that all of these factors are highly correlated with parental education levels. Third, using a sample of individuals who lost a parent above the critical age where it would matter for our outcome variable (age 18), our placebo analysis yields coefficients of interest that are completely insignificant. In fact, the parent-child relationship in schooling is virtually identical for those that did not lose either parent versus those that lost a parent after the test was taken. Fourth, we show that the death of the mother yields completely opposite results relative to the death of the father. This reverse pattern is to be expected if the effects are causal – since increasing time spent with the mother due to the father's death is the opposite of increasing time spent with the father due to the mother's death. However, if the results were picking up a spurious correlation with unobserved factors, it would have to be the case that when one parent dies, the education levels of both parents are correlated in opposing ways with one omitted variable, and then each would have to be correlated in the reverse direction (but still in opposite signs) with a different factor when the other parent dies. On top of that, all of these correlations would have to get stronger when the given parent dies earlier.

This scenario seems unlikely for a number of reasons. First, the education levels of the mother and father are highly and positively correlated, and therefore, are likely to be correlated in the same direction with omitted variables. Second, families that lose a mother are similar to families that lose a father in terms of coming from a lower socioeconomic background, so it is likely that they are also similar in terms of

unmeasured characteristics that affect child schooling outcomes. Therefore, we believe there is strong evidence that our results are coming from a causal effect of parental education.

Although we use a completely different empirical strategy, our results are consistent with recent evidence that parental education plays an important role on child test scores and other behaviors. In addition, our findings help reconcile the variation in results across recent studies. Holmlund, Lindahl, and Plug (2010) suggest that different methods produce different results because each method is using variation in a different part of the parental education distribution. Our results indicate that this is indeed the case – we find much stronger effects of parental education in the lower part of the parental education distribution (less than 12 years of schooling) than the upper part. In addition, we find that parental schooling has a bigger effect on children who are near the borderline of passing the matriculation exam relative to those that are well above the passing threshold.

Perhaps most importantly, our findings can help understand the recent puzzle put forward by Guryan, Hurst, and Kearney (2008), who show that educated parents spend more time with their children despite the higher opportunity cost of time. They show that educated parents cut back every type of non-market activity except for childcare in response to their higher cost of time. One explanation could be that educated parents consider their time with children more as leisure than less educated parents. Our findings suggest a different explanation – educated parents are simply more productive in developing the human capital of their children.

Overall, our analysis deepens our understanding of the mechanisms behind a causal impact of parental education on child outcomes, by linking the literature on the intergenerational transmission of human capital with the literature on parental time inputs. In fact, our analysis suggests that these issues are inextricably linked, and need to be considered together. This finding should have important implications in terms of understanding how married couples allocate their time across various activities, how this is changing over time, and how these trends might be affecting the outcomes of children.

VII. References

Adda, Jerome; Bjorklund, Anders; and Helena Holmlund. "The Role of Mothers and Fathers in Providing Skills: Evidence from Parental Deaths," IZA DP No. 5425, January 2011.

Behrman, Jere R., and Paul Taubman, "Is Schooling 'Mostly in the Genes'? Nature–Nurture Decomposition Using Data on Relatives," *Journal of Political Economy*, XCVII (1989), 1425–1446.

Belzil, Christian and Jörgen Hansen. 2003. "Structural Estimates of the Intergenerational Education Correlation." *Journal of Applied Econometrics*, 18(6): 679-696.

Black, Sandra, Paul J. Devereux, and Kjell G. Salvanes, "Why the Apple Doesn't Fall Far: Understanding Intergenerational Transmission of Human Capital," *American Economic Review*, XCV (2005a), 437–449.

Black, Sandra, Paul J. Devereux, and Kjell G. Salvanes, "The More the Merrier? The Effect of Family Size and Birth Order on Children's Education," *Quarterly Journal of Economics*, 120(2), (2005b), 669-700.

Björklund, Anders, Mikael Lindahl and Erik Plug. "The Origins of Intergenerational Associations: Lessons from Swedish Adoption Data" *Quarterly Journal of Economics*, 2006, 121 (3), 999 – 1028.

Carneiro, Pedro, Meghir, Costas, and Matthias Parey. 2007. "Maternal Education, Home Environments and the Development of Children and Adolescents." IZA DP No. 3072.

Case, Anne and Cally Ardington. 2006. "The impact of parental death on school outcomes: Longitudinal evidence from South Africa," *Demography*, 43(3): 401-420.

Case, Anne, Christina Paxson and Joseph Ableidinger. 2004. "Orphans in Africa: Parental Death, Poverty and School Enrollment," *Demography*, 41(3): 483-508.

Chen, Stacey H., Yen-Chien Chen, and Jin-Tan Liu. 2009. "The Impact of Unexpected Maternal Death on Education: First Evidence from Three National Administrative Data Links." *American Economic Review*, 99(2): 149–53.

Coleman, James S. 1988. "Social Capital in the Creation of Human Capital." *The American Journal of Sociology*, vol. 94, Supplement: Organizations and

Institutions: Sociological and Economic Approaches to the Analysis of Social Structure, pp. S95–S120.

Corak, Miles. 2001. "Death and Divorce: The Long-Term Consequences of Parental Loss on Adolescents" *Journal of Labor Economics*, 19(3): 682-715.

Currie, Janet, and Enrico Moretti, "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings," *Quarterly Journal of Economics*, CXVIII (2003), 1495–1532.

Datcher-Loury, Linda, "Effects of Mother 's Home Time on Children's Schooling," *Review of Economics and Statistics*, 70 (1988), 367–373.

Gertler, Paul, David I. Levine and Minnie Ames. 2004. "Parental Death and Schooling," *Review of Economics and Statistics*, 86(1): 211-225.

Gould, Eric D., Lavy, Victor, and M. Daniele Paserman. "Sixty Years after the Magic Carpet Ride: The Long-Run Effect of the Early Childhood Environment on Social and Economic Outcomes," *Review of Economic Studies*, 2011, forthcoming.

Guryan , Jonathan; Hurst, Erik; and Melissa Kearney. " Parental Education and Parental Time with Children," *Journal of Economic Perspectives,* 22 (3), Summer 2008, 23–46.

Haveman, Robert, and Barbara Wolfe. 1995. "The Determinants of Children's Attainments: A Review of M ethods and Findings." *Journal of Economic Literature*, 33(4): 1829–79.

Holmlund, Helena, Mikael Lindahl, and Erik Plug. "The Causal Effect of Parents' Schooling on Children's Schooling A Comparison of Estimation Methods," CESIFO Working Paper No. 3234, November 2010.

Haegeland, Torbjorn; Kirkeboen, Lars Johannessen; Raaum, Oddbjorn; and Kjell G. Salvanes. "Why Children of College Graduates Outperform their Schoolmates: A Study of Cousins and Adoptees," IZA DP No. 5369, December 2010.

Kling J. R., Liebman, J. B., and Katz, L. F. (2007), "Experimental Analysis of Neighborhood Effects", *Econometrica*, 75(1), 83–119.

Kimmel, Jean, and Rachel Connelly (2007). "Mothers' Time Choices: Caregiving, Leisure, Home Production, and Paid Work*." Journal of Human Resources*, 42(3), 643–61.

Lang, Kevin and Jay L. Zagorsky. 2001. "Does Growing up with a Parent Absent Really Hurt?" *Journal of Human Resources*, 36(2): 253-273.

Leibowitz, Arleen, 1974a. "Education and Home Production," *American Economic Review* 64 (1974a), 243-250.

Leibowitz, Arleen. "Home Investments in Children." *Journal of Political Economy*, (1974b), 82(2): 111–31.

Leibowitz, Arleen. 1977. "Parental Inputs and Children's Achievement." *Journal of Human Resources,* 12(2): 243–51.

Maurin, Eric and Sandra McNally (2008). "Vive la revolution! Long-term education Returns of 1968 to the angry students," *Journal of Labor Economics* 26: 1-33.

Oreopoulos, Philip, Marianne Page and Anne Huff Stevens. 2006. "The Intergenerational Effects of Compulsory Schooling." *Journal of Labor Economics,* 24(4): 729-760.

Plug, Erik, "Estimating the Effect of Mother's Schooling on Children's Schooling Using a Sample of Adoptees," *American Economic Review*, XCIV (2004), 358–368.

Plug, Erik, and Wim Vijverberg, "Schooling, Family Background and Adoption: Is it Nature or is it Nurture?," *Journal of Political Economy*, CXI (2003), 611–641.

Table 1: Summary Statistics

	Death of Mother Analysis		Death of Father Analysis	
	Father Alive at age 18		Mother Alive at age 18	
	Mother Did Not Die	Mother Died	Father Did Not Die	Father Died
Passed Matriculation Exam	0.527	0.497	0.532	0.45
Passed Matriculation Exam (of those in 12th Grade)	0.564	0.528	0.569	0.484
Mother's Education	12.27 (2.98)	11.75 (3.22)	12.33 (2.96)	11.35 (3.10)
Father's Education	12.3 (3.23)	12.07 (3.33)	12.35 (3.23)	11.2 (3.34)
Mother's Log Income 1988	7.81 (3.20)	7.77 (3.27)	7.83 (3.19)	7.74 (3.23)
Father's Log Income 1988	9.11 (3.07)	9.15 (3.09)	9.11 (3.09)	9.08 (2.93)
Live Parent Remarried when Child < 18		0.194		0.05
Took Matriculation Exam	0.79	0.77	0.80	0.73
Dropout before 12th Grade	0.06	0.06	0.06	0.08
Hebrew Score > 80	0.24	0.23	0.24	0.18
Hebrew Score > 70	0.48	0.45	0.49	0.40
English Score > 80	0.25	0.23	0.26	0.19
English Score > 70	0.47	0.44	0.48	0.38
Torah Score > 80	0.21	0.20	0.22	0.16
Torah Score > 70	0.39	0.37	0.40	0.32
Math Score > 80	0.34	0.31	0.35	0.27
Math Score > 70	0.47	0.43	0.47	0.38
Child's Age when Parent Died if under 18		12.50 (4.74)		12.19 (4.97)
Year Parent Died if under 18		1992.81 (5.85)		1992.27 (6.12)
Sample Size	275,784	12,742	265,390	33,132

Notes: Numbers represent means of the variable in the row, numbers in parentheses represent standard deviations. The sample includes all native born Israeli Jews who were not in the ultra-orthodox school system that were born between 1974 and 1986 (i.e. in the 1992 to 2004 12th grade cohort).

Table 2: Descriptive Regressions

	Children Who Did not Lose a Mother or Father						Only Children Who Lost a Mother before Age 18 (and Father Alive)			Only Children Who Lost a Father before Age 18 (and Mother Alive)		
Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade			Not Including Dropouts Before 12th Grade			Including Dropouts Before 12th Grade	Not Including Dropouts Before 12th Grade		Including Dropouts Before 12th Grade	Not Including Dropouts Before 12th Grade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mother's Educ	0.0449*** (0.000)		0.0264*** (0.000)	0.0258*** (0.001)	0.0208*** (0.000)	0.0191*** (0.000)	0.0197*** (0.003)	0.0203*** (0.003)	0.0155*** (0.003)	0.0328*** (0.002)	0.0316*** (0.002)	0.0255*** (0.002)
Father's Educ		0.0406*** (0.000)	0.0245*** (0.000)	0.0237*** (0.000)	0.0185*** (0.000)	0.0174*** (0.000)	0.0268*** (0.003)	0.0263*** (0.003)	0.0222*** (0.003)	0.0163*** (0.001)	0.0167*** (0.001)	0.0135*** (0.002)
Age of Mother at Child's Birth	0.0138*** (0.000)	0.0138*** (0.000)	0.0120*** (0.000)	0.0116*** (0.000)	0.0096*** (0.000)	0.0090*** (0.000)	0.0095*** (0.002)	0.0087*** (0.002)	0.0085*** (0.002)	0.0130*** (0.001)	0.0119*** (0.001)	0.0094*** (0.001)
Age of Father at Child's Birth	0.0033*** (0.000)	0.0029*** (0.000)	0.0034*** (0.000)	0.0030*** (0.000)	0.0021*** (0.000)	0.0023*** (0.000)	0.0018 (0.002)	0.0017 (0.002)	0.001 (0.002)	-0.0003 (0.001)	-0.0001 (0.001)	0.0001 (0.001)
Number of Siblings	-0.0068*** (0.001)	-0.0115*** (0.001)	-0.0099*** (0.001)	-0.0053*** (0.001)	-0.0041*** (0.001)	-0.001 (0.001)	-0.0104* (0.006)	-0.0089 (0.007)	-0.0117 (0.007)	-0.0112*** (0.004)	-0.0069* (0.004)	-0.0124*** (0.004)
Male	-0.1201*** (0.002)	-0.1210*** (0.002)	-0.1213*** (0.002)	-0.1027*** (0.002)	-0.0847*** (0.002)	-0.0860*** (0.002)	-0.1096*** (0.012)	-0.0943*** (0.013)	-0.0665*** (0.013)	-0.1270*** (0.007)	-0.1085*** (0.008)	-0.0859*** (0.008)
Mother's Log Income 1988						0.0143*** (0.001)						
Father's Log Income 1988						0.0248*** (0.001)						
Mother's Income is Zero in 1988						0.0934*** (0.008)						
Father's Income is Zero in 1988						0.2310*** (0.011)						
Observations	259284	259284	259284	242535	242535	242535	5958	5604	5604	16086	14825	14825
Number of School Fixed-Effects	None	None	None	None	1086	1086	None	None	675	None	None	829

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include dummy variables for each cohort year and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 3: Mother Loss Analysis - The Effect of Losing a Mother and the Interaction with Parental Education

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade				With School Fixed Effects: Not Including Dropouts Before 12th Grade			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother Died		-0.015**		-0.014**		-0.007		-0.007
		(0.006)		(0.006)		(0.006)		(0.006)
Mother Died when Child < 18	-0.018**	-0.018**	0.120***	0.092***	-0.027***	-0.026***	0.066*	0.053*
	(0.009)	(0.008)	(0.038)	(0.029)	(0.009)	(0.008)	(0.038)	(0.028)
Mother's Educ	0.024***	0.026***	0.028***	0.027***	0.019***	0.021***	0.022***	0.021***
	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)	(0.000)	(0.003)	(0.000)
Father's Educ	0.027***	0.025***	0.026***	0.025***	0.021***	0.019***	0.020***	0.019***
	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)	(0.000)	(0.003)	(0.000)
Mother Died when Child < 18 interacted with:								
Mother's Educ			-0.007*	-0.006**			-0.004	-0.004*
			(0.004)	(0.002)			(0.004)	(0.002)
Father's Educ			0.000	0.001			0.001	0.002
			(0.003)	(0.002)			(0.004)	(0.002)
Age of Child when Mother Died			-0.005***	-0.005***			-0.005***	-0.004***
			(0.001)	(0.001)			(0.001)	(0.001)
Observations	12691	288526	12691	288526	11926	269846	11926	269846
Number of School Fixed-Effects	None	None	None	None	743	1088	743	1088
Sample	Mom Loss Any Age	All	Mom Loss Any Age	All	Mom Loss Any Age	All	Mom Loss Any Age	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 4: Mother Loss Analysis - The Interaction of Parental Education with Age of Child when Mother Died

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade			With School Fixed Effects Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother Died			-0.0145**			-0.007
			(0.0058)			(0.0057)
Mother Died when Child < 18		0.2881***	0.2503***		0.2260***	0.1859***
		(0.0743)	(0.0686)		(0.0756)	(0.0669)
Mother's Educ		0.0281***	0.0267***		0.0217***	0.0209***
		(0.0027)	(0.0004)		(0.0028)	(0.0004)
Father's Educ		0.0264***	0.0247***		0.0196***	0.0185***
		(0.0026)	(0.0004)		(0.0026)	(0.0004)
Mother Died when Child < 18 interacted with:						
Mother's Educ	-0.0029	-0.0345***	-0.0304***	-0.0033	-0.0290***	-0.0274***
	(0.0060)	(0.0067)	(0.0059)	(0.0063)	(0.0067)	(0.0057)
Father's Educ	0.0366***	0.0131*	0.0120*	0.0312***	0.0119*	0.0134**
	(0.0065)	(0.0071)	(0.0064)	(0.0068)	(0.0071)	(0.0062)
Mother's Educ*Age of Child when Mother Died	0.0021***	0.0024***	0.0022***	0.0018***	0.0022***	0.0020***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Father's Educ*Age of Child when Mother Died	-0.0010**	-0.0012**	-0.0010**	-0.0008	-0.0010*	-0.0010**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Age of Child when Mother Died	-0.0181***	-0.0192***	-0.0182***	-0.0157***	-0.0180***	-0.0158***
	(0.0052)	(0.0053)	(0.0051)	(0.0055)	(0.0053)	(0.0050)
Observations	6225	12691	288526	5857	11926	269846
Number of School Fixed-Effects	None	None	None	681	743	1088
Sample	Mom Loss < 18	Mom Loss Any Age	All	Mom Loss < 18	Mom Loss Any Age	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 5: Mother Loss Analysis with Parental Wages in the Specification

	Students Whose Mother and Father Were Alive in 1988							
	Including Dropouts Before 12th Grade				With School Fixed Effects Not Including Dropouts Before 12th Grade			
Dependant Variable: Pass Matriculation Exam	All		Students with Non-zero Income for Both Parents		All		Students with Non-zero Income for Both Parents	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother Died	-0.0145**	-0.0134**	-0.0249***	-0.0237***	-0.007	-0.0062	-0.0178**	-0.0171**
	(0.0058)	(0.0058)	(0.0088)	(0.0087)	(0.0057)	(0.0057)	(0.0085)	(0.0085)
Mother Died when Child < 18	0.4831***	0.4078***	0.1169	0.6221	0.3079***	0.2526**	-0.0005	0.8688
	(0.1178)	(0.1224)	(0.2026)	(0.5051)	(0.1169)	(0.1217)	(0.1995)	(0.5294)
Mother's Educ	0.0267***	0.0243***	0.0250***	0.0228***	0.0209***	0.0192***	0.0194***	0.0178***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0006)	(0.0006)
Father's Educ	0.0248***	0.0231***	0.0251***	0.0232***	0.0186***	0.0175***	0.0182***	0.0170***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0005)	(0.0005)
Mother's Log Income 1988		0.0205***		0.0226***		0.0148***		0.0167***
		(0.0009)		(0.0010)		(0.0008)		(0.0010)
Father's Log Income 1988		0.0339***		0.0365***		0.0243***		0.0266***
		(0.0010)		(0.0013)		(0.0010)		(0.0013)
Mother's Income is Zero in 1988		0.1381***				0.0989***		
		(0.0077)				(0.0077)		
Father's Income is Zero in 1988		0.3158***				0.2269***		
		(0.0101)				(0.0100)		
Mother Died when Child < 18 interacted with:								
Mother's Educ	-0.0485***	-0.0440***	-0.0383**	-0.0319**	-0.0367***	-0.0331***	-0.025	-0.0206
	(0.0110)	(0.0111)	(0.0159)	(0.0159)	(0.0108)	(0.0109)	(0.0154)	(0.0154)
Father's Educ	0.0137	0.0097	0.0360**	0.0357**	0.0173	0.0139	0.0329**	0.0370**
	(0.0113)	(0.0113)	(0.0170)	(0.0175)	(0.0112)	(0.0113)	(0.0167)	(0.0174)
Mother's Educ*Age of Child when Mother Died	0.0035***	0.0032***	0.0030***	0.0025**	0.0027***	0.0025***	0.0022**	0.0019*
	(0.0008)	(0.0008)	(0.0011)	(0.0011)	(0.0008)	(0.0008)	(0.0011)	(0.0011)
Father's Educ*Age of Child when Mother Died	-0.0012	-0.0009	-0.0028**	-0.0029**	-0.0013*	-0.0011	-0.0026**	-0.0029**
	(0.0008)	(0.0008)	(0.0012)	(0.0012)	(0.0008)	(0.0008)	(0.0011)	(0.0012)
Age of Child when Mother Died	-0.0334***	-0.0281***	-0.0091	-0.0434	-0.0239***	-0.0198**	-0.0039	-0.0607*
	(0.0081)	(0.0084)	(0.0137)	(0.0337)	(0.0080)	(0.0083)	(0.0135)	(0.0349)
Mother's Log Income 1988		-0.0025		-0.0051		-0.0043		-0.0133
		(0.0065)		(0.0348)		(0.0064)		(0.0345)
Father's Log Income 1988		0.0109*		-0.0547		0.0094		-0.0856*
		(0.0064)		(0.0434)		(0.0063)		(0.0468)
Mother's Log Income 1988*Age of Child when Mother Died		0.0001		0.0004		0.0002		0.0009
		(0.0004)		(0.0023)		(0.0004)		(0.0023)
Father's Log Income 1988*Age of Child when Mother Died		-0.0007*		0.0037		-0.0007		0.0057*
		(0.0004)		(0.0029)		(0.0004)		(0.0031)
Mother's Income is Zero in 1988		-0.0798*				-0.0953**		
		(0.0428)				(0.0407)		
Father's Income is Zero in 1988		-0.042				-0.0337		
		(0.0526)				(0.0499)		
Observations	287133	287133	131286	131286	268503	268503	124343	124343
Number of School Fixed-Effects	None	None	None	None	1088	1088	1044	1044

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 6: Placebo Analysis using those that Lost a Mother Above the Age of 18

	All Who Did Not Lose Mother or Father	Students who Lost a Mother when Student was Above Age 18 (and Father alive)					
Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade	Including Dropouts Before 12th Grade			Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mother's Educ	0.0264***	0.0294***	0.0626***	0.0634***	0.0485**	0.0155	0.0187
	(0.000)	(0.0029)	(0.0214)	(0.0216)	(0.0224)	(0.0219)	(0.0222)
Father's Educ	0.0245***	0.0261***	-0.0014	-0.0042	0.0047	0.0254	0.0235
	(0.000)	(0.0026)	(0.0200)	(0.0200)	(0.0209)	(0.0205)	(0.0205)
Mother's Educ*Age of Child when Mother Died			-0.0014	-0.0016*	-0.0009	0.0003	0.0001
			(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Father's Educ*Age of Child when Mother Died			0.0012	0.0012	0.0009	-0.0003	-0.0003
			(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)
Age of Child when Mother Died			0.0011	0.0033	-0.0032	-0.0036	-0.0023
			(0.0081)	(0.0084)	(0.0084)	(0.0082)	(0.0086)
Mother's Log Income 1988				0.0246**			0.0149
				(0.0121)			(0.0124)
Father's Log Income 1988				0.0444***			0.0204
				(0.0121)			(0.0124)
Mother's Income is Zero in 1988				0.3001***			0.2379***
				(0.0568)			(0.0594)
Father's Income is Zero in 1988				0.3227***			0.1367*
				(0.0728)			(0.0763)
Mother's Log Income 1988*Age of Child when Mother Died				0.0005			0.0005
				(0.0004)			(0.0004)
Father's Log Income 1988*Age of Child when Mother Died				-0.0005			-0.0003
				(0.0004)			(0.0004)
Observations	259284	6017	6017	6017	5642	5642	5642
Number of School Fixed-Effects	None	None	None	None	None	592	592

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 7: Controlling for the Cause of Death

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade				With School Fixed Effects: Not Including Dropouts Before 12th Grade			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother Loss Analysis								
Mother Died when Child < 18 interacted with:								
Mother's Educ	-0.0029	-0.0043	-0.0046	-0.0033	-0.0034	-0.0035	-0.0134	0.0068
	(0.0060)	(0.0059)	(0.0083)	(0.0084)	(0.0063)	(0.0063)	(0.0091)	(0.0099)
Father's Educ	0.0366***	0.0353***	0.0385***	0.0314***	0.0312***	0.0302***	0.0418***	0.0185*
	(0.0065)	(0.0064)	(0.0093)	(0.0088)	(0.0068)	(0.0068)	(0.010)	(0.010)
Mother's Educ*Age of Child when Mother Died	0.0021***	0.0023***	0.0024***	0.0020***	0.0018***	0.0018***	0.0023***	0.0011
	(0.0005)	(0.0005)	(0.0007)	(0.0007)	(0.0005)	(0.0005)	(0.0007)	(0.0008)
Father's Educ*Age of Child when Mother Died	-0.0010	-0.0010	-0.0015	-0.0003	-0.0008	-0.0008	-0.0018	0.0007
	(0.0005)	(0.0005)	(0.0007)	(0.0007)	(0.0005)	(0.0005)	(0.0008)	(0.0008)
Observations	6225	6225	3574	2651	5857	5857	3574	2283
Number of School Fixed-Effects	None	None	None	None	681	681	607	543
Cause of Death Fixed-Effects	No	Yes	No	Yes	No	Yes	No	Yes
Father Loss Analysis								
Father Died when Child < 18 interacted with:								
Mother's Educ	0.0360***	0.0344***	0.0317***	0.0349***	0.0264***	0.0267***	0.0230**	0.0286***
	(0.0039)	(0.0038)	(0.0088)	(0.0043)	(0.0040)	(0.0040)	(0.0093)	(0.0046)
Father's Educ	0.0086***	0.0088***	0.0086	0.0089**	0.0086**	0.0085**	0.0051	0.0079**
	(0.0033)	(0.0033)	(0.0075)	(0.0036)	(0.0034)	(0.0034)	(0.0079)	(0.0039)
Mother's Educ*Age of Child when Father Died	-0.0003	-0.0003	0.0000	-0.0004	-0.0001	-0.0001	0.0000	-0.0002
	(0.0003)	(0.0003)	(0.0007)	(0.0003)	(0.0003)	(0.0003)	(0.0007)	(0.0004)
Father's Educ*Age of Child when Father Died	0.0007***	0.0007***	0.0009	0.0006**	0.0005	0.0005*	0.001	0.0004
	(0.0002)	(0.0003)	(0.0006)	(0.0003)	(0.0003)	(0.0003)	(0.0006)	(0.0003)
Observations	16383	16383	4007	12376	15096	15096	4007	11089
Number of School Fixed-Effects	None	None	None	None	830	830	625	788
Cause of Death Fixed-Effects	No	Yes	No	Yes	No	Yes	No	Yes
Sample	Parent Loss < 18	Parent Loss < 18	Parent Loss from Cancer < 18	Parent Loss not from Cancer < 18	Parent Loss < 18	Parent Loss < 18	Parent Loss from Cancer < 18	Parent Loss not from Cancer < 18

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. The upper panel uses a sample of only those that lost a mother before the age of 18, while the bottom panel uses a sample of only those that lost a father before the age of 18. All regressions are specified with the same variables used in the main analysis of maternal or parental death (Table 4 for maternal loss and Table 14 for paternal loss). The specifications which include "cause of death fixed-effects" include 20 dummy variables for each cause of death (described in Appendix Table 1) as well as a dummy variable for the cause of parental death being missing.

Table 8: Remarriage Analysis

	Maternal Loss				Paternal Loss			
Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade		With School Fixed Effects Not Including Dropouts Before 12th Grade		Including Dropouts Before 12th Grade		With School Fixed Effects Not Including Dropouts Before 12th Grade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Children Whose Parent Died when Child < 18								
Mother's Educ	-0.0029	-0.017**	-0.0033	-0.018**	0.0360***	0.0358***	0.0264***	0.0264***
	(0.006)	(0.008)	(0.006)	(0.009)	(0.0039)	(0.0042)	(0.0040)	(0.0040)
Father's Educ	0.0366***	0.037***	0.0312***	0.039***	0.0086***	0.0075**	0.0086**	0.0086**
	(0.007)	(0.009)	(0.007)	(0.010)	(0.0033)	(0.0036)	(0.0034)	(0.0034)
Mother's Educ*Age of Child when Parent Died	0.0021***	0.003***	0.0018***	0.003***	-0.0003	-0.0003	-0.0001	-0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Father's Educ*Age of Child when Parent Died	-0.0010**	-0.0010	-0.0008	-0.001*	0.0007***	0.0008***	0.0005	0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Observations	6225	5012	5857	4710	16383	15595	15096	15096
Number of School Fixed-Effects	None	None	681	646	None	None	830	830
Sample	Mom Loss < 18	Mom Loss< 18 and Father Did not Remarry	Mom Loss < 18	Mom Loss< 18 and Father Did not Remarry	Dad Loss < 18	Dad Loss< 18 and Mother Did not Remarry	Dad Loss < 18	Dad Loss< 18 and Mother Did not Remarry

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. The left panel uses a sample of only those that lost a mother before the age of 18, while the right panel uses a sample of only those that lost a father before the age of 18. All regressions are specified with the same variables used in the main analysis of maternal or parental death (Table 4 for maternal loss and Table 14 for paternal loss).

Table 9: Mother Loss Analysis - Examining the Effect on Taking the Matriculation Exam

	Dependent Variable: Passing or Taking the Matriculation Exam					
	Pass	Pass	Take	Pass	Pass	Take
				With School Fixed Effects		
	Including Dropouts Before 12th Grade			Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother Died	-0.0145**	-0.005	-0.0184***	-0.007	-0.002	-0.0099**
	(0.006)	(0.007)	(0.005)	(0.006)	(0.006)	(0.004)
Mother Died when Child < 18	0.2503***	0.1892**	0.2491***	0.1859***	0.1934***	0.1044**
	(0.069)	(0.077)	(0.057)	(0.067)	(0.075)	(0.047)
Mother's Educ	0.0267***	0.0186***	0.0190***	0.0209***	0.0157***	0.0121***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
Father's Educ	0.0247***	0.0188***	0.0148***	0.0185***	0.0152***	0.0083***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother Died when Child < 18 interacted with:						
Mother's Educ	-0.0304***	-0.0227***	-0.0233***	-0.0274***	-0.0233***	-0.0159***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.004)
Father's Educ	0.0120*	0.010	0.004	0.0134**	0.009	0.0074*
	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)	(0.004)
Mother's Educ*Age of Child when Mother Died	0.0022***	0.0019***	0.0015***	0.0020***	0.0019***	0.0011***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Father's Educ*Age of Child when Mother Died	-0.0010**	-0.0009*	0.000	-0.0010**	-0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Age of Child when Mother Died	-0.0182***	-0.0173***	-0.0165***	-0.0158***	-0.0176***	-0.0094***
	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)
Observations	288526	228817	288526	269846	228817	269846
Number of School Fixed-Effects	None	None	None	1088	1050	1088
Sample	All	Only Takers	All	All	Only Takers	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 10: Mother Loss Analysis - Results using Different Subjects as Outcomes

	Dependent Variable								
	Pass Matriculation	Math > 80	Math > 70	Hebrew > 80	Hebrew > 70	Bible > 80	Bible > 70	English > 80	English > 70
	Sample: All Students (n=288526) including dropouts before 12th Grade								
Mother Died	-0.0145**	-0.0181***	-0.0181***	-0.003	-0.0110*	0.001	-0.0108*	-0.007	-0.0166***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Mother Died when Child < 18	0.2503***	0.090	0.2446***	0.1096*	0.1951***	0.076	0.102	0.1371**	0.1839***
	(0.069)	(0.066)	(0.069)	(0.058)	(0.067)	(0.057)	(0.067)	(0.060)	(0.067)
Mother's Educ	0.0267***	0.0196***	0.0236***	0.0221***	0.0298***	0.0181***	0.0259***	0.0194***	0.0261***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ	0.0247***	0.0200***	0.0230***	0.0218***	0.0272***	0.0177***	0.0240***	0.0215***	0.0241***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother Died when Child < 18 interacted with:									
Mother's Educ	-0.0304***	-0.009	-0.0226***	-0.0188***	-0.0311***	-0.0193***	-0.0183***	-0.0147***	-0.0208***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Father's Educ	0.0120*	0.005	0.005	0.0094*	0.0162***	0.0132**	0.0123**	0.002	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Mother's Educ*Age of Child when Mother Died	0.0022***	0.001	0.0013***	0.0012***	0.0021***	0.0014***	0.0010**	0.001	0.0010**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Father's Educ*Age of Child when Mother Died	-0.0010**	-0.001	0.000	-0.001	-0.0011**	-0.0010**	-0.0009*	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Age of Child when Mother Died	-0.0182***	-0.003	-0.0152***	-0.006	-0.0142***	-0.005	-0.005	-0.005	-0.0110**
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
	Sample: Not Including dropouts before 12th Grade (n=269846) with 1088 School Fixed-Effects								
Mother Died	-0.007	-0.0135**	-0.0115**	0.001	-0.004	0.005	-0.004	-0.003	-0.0101*
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Mother Died when Child < 18	0.186***	0.032	0.1661**	0.087	0.1180*	0.040	0.035	0.1089*	0.1174*
	(0.067)	(0.067)	(0.068)	(0.060)	(0.065)	(0.059)	(0.067)	(0.062)	(0.067)
Mother's Educ	0.021***	0.0151***	0.0177***	0.0191***	0.0232***	0.0156***	0.0205***	0.0168***	0.0207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ	0.019***	0.0152***	0.0167***	0.0184***	0.0204***	0.0149***	0.0183***	0.0193***	0.0191***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother Died when Child < 18 interacted with:									
Mother's Educ	-0.027***	-0.006	-0.0185***	-0.0169***	-0.0280***	-0.0178***	-0.0156***	-0.0128**	-0.0177***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Father's Educ	0.013**	0.005	0.006	0.009	0.0181***	0.0142**	0.0141**	0.002	0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Mother's Educ*Age of Child when Mother Died	0.002***	0.000	0.0010**	0.0010**	0.0018***	0.0013***	0.0009*	0.001	0.0008*
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Father's Educ*Age of Child when Mother Died	-0.001**	-0.001	0.000	-0.001	-0.0011**	-0.0011***	-0.0009*	0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Age of Child when Mother Died	-0.016***	0.000	-0.0114**	-0.005	-0.0106**	-0.003	-0.002	-0.004	-0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 11: Heterogeneous Effects by Parental Education Levels

	Maternal Loss				Paternal Loss			
Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade		With School Fixed Effects Not Including Dropouts Before 12th Grade		Including Dropouts Before 12th Grade		With School Fixed Effects Not Including Dropouts Before 12th Grade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Children Whose Parent Died when Child < 18								
Mother's Educ	-0.0306***	-0.0088	-0.0256**	-0.0087	0.0193***	-0.0011	0.0159***	-0.0038
	(0.0101)	(0.0109)	(0.0100)	(0.0103)	(0.0056)	(0.0056)	(0.0057)	(0.0054)
Father's Educ	0.0128	0.0084	0.0144	0.0107	-0.0152***	0.007	-0.0089	0.0097
	(0.0113)	(0.0080)	(0.0112)	(0.0077)	(0.0055)	(0.0061)	(0.0055)	(0.0060)
Mother's Educ*Age of Child when Parent Died	0.0028***	0.0008	0.0026***	0.0008	-0.0013***	0.0007	-0.0012***	0.0008*
	(0.0009)	(0.0008)	(0.0009)	(0.0008)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Father's Educ*Age of Child when Parent Died	-0.0014	-0.0006	-0.0015*	-0.0007	0.0012***	-0.0007	0.0008*	-0.0008*
	(0.0009)	(0.0006)	(0.0009)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Observations	106454	182072	95993	173853	122158	176364	110561	168362
Number of School Fixed-Effects	None	None	999	1070	None	None	1026	1064
Sample	Mother Educ<12	Mother Educ>=12	Mother Educ<12	Mother Educ>=12	Father Educ<12	Father Educ>=12	Father Educ<12	Father Educ>=12

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. The left panel uses a sample of only those that did not lose a father below the age of 18, while the right panel uses a sample of only those that did not lose a mother below the age of 18. All regressions are specified with the same variables used in the main analysis of maternal or parental death (Table 4 for maternal loss and Table 14 for paternal loss).

Table 12: Mother Loss Analysis for Boys and Girls Separately

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade				With School Fixed Effects: Not Including Dropouts Before 12th Grade			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Mother Died	-0.0056	-0.0228***	-0.0056	-0.0227***	-0.0007	-0.0135*	-0.0007	-0.0135*
	(0.0083)	(0.0081)	(0.0083)	(0.0081)	(0.0083)	(0.0078)	(0.0083)	(0.0078)
Mother Died when Child < 18	-0.0215*	-0.0152	0.3221***	0.1968**	-0.0248**	-0.0273**	0.2394**	0.1485*
	(0.0117)	(0.0115)	(0.1000)	(0.0942)	(0.0116)	(0.0110)	(0.0997)	(0.0902)
Mother's Educ	0.0269***	0.0261***	0.0271***	0.0263***	0.0200***	0.0210***	0.0202***	0.0212***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Father's Educ	0.0257***	0.0240***	0.0256***	0.0239***	0.0195***	0.0175***	0.0194***	0.0174***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0005)
Mother Died when Child < 18 interacted with:								
Mother's Educ			-0.0199**	-0.0406***			-0.0182**	-0.0356***
			(0.0085)	(0.0082)			(0.0083)	(0.0078)
Father's Educ			-0.0032	0.0253***			0.0024	0.0217***
			(0.0096)	(0.0086)			(0.0095)	(0.0082)
Mother's Educ*Age of Child when Mother Died			0.0013*	0.0031***			0.0013*	0.0027***
			(0.0007)	(0.0007)			(0.0007)	(0.0006)
Father's Educ*Age of Child when Mother Died			0.0002	-0.0020***			-0.0002	-0.0017***
			(0.0007)	(0.0007)			(0.0007)	(0.0006)
Age of Child when Mother Died			-0.0225***	-0.0154**			-0.0197***	-0.0129*
			(0.0075)	(0.0070)			(0.0074)	(0.0068)
Observations	141995	146531	141995	146531	128924	140922	128924	140922
Number of School Fixed-Effects	None	None	None	None	1046	1044	1046	1044
Sample	All Boys or Girls				All Boys or Girls			

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 13: Father Loss Analysis - The Effect of Losing a Father and the Interaction with Parental Education

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade				With School Fixed Effects Not Including Dropouts Before 12th Grade			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Father Died		-0.032***		-0.031***		-0.024***		-0.024***
		(0.004)		(0.004)		(0.004)		(0.004)
Father Died when Child < 18	-0.007	-0.004	0.043*	0.040**	-0.013**	-0.010**	0.006	0.022
	(0.006)	(0.005)	(0.022)	(0.018)	(0.006)	(0.005)	(0.023)	(0.017)
Mother's Educ	0.030***	0.027***	0.026***	0.027***	0.023***	0.021***	0.021***	0.021***
	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)
Father's Educ	0.020***	0.024***	0.026***	0.025***	0.014***	0.018***	0.017***	0.018***
	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)
Father Died when Child < 18 interacted with:								
Mother's Educ			0.007***	0.006***			0.004*	0.004***
			(0.002)	(0.002)			(0.002)	(0.002)
Father's Educ			-0.009***	-0.008***			-0.004*	-0.006***
			(0.002)	(0.001)			(0.002)	(0.001)
Age of Child when Father Died			-0.002**	-0.002***			-0.001*	-0.001**
			(0.001)	(0.001)			(0.001)	(0.001)
Observations	32909	298522	32909	298522	30446	278923	30446	278923
Number of School Fixed-Effects	None	None	None	None	873	1088	873	1088
Sample	Dad Loss Any Age	All	Dad Loss Any Age	All	Dad Loss Any Age	All	Dad Loss Any Age	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 14: Father Loss Analysis - The Interaction of Parental Education with Age of Child when Father Died

	Dependent Variable: Dummy for Passing the Maticulation Exam					
	Including Dropouts Before 12th Grade			With School Fixed Effects Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)
Father Died			-0.0315***			-0.0243***
			(0.0038)			(0.0037)
Father Died when Child < 18		0.0888**	0.0908**		0.0521	0.0769**
		(0.0423)	(0.0382)		(0.0428)	(0.0380)
Mother's Educ		0.0263***	0.0266***		0.0208***	0.0209***
		(0.0017)	(0.0004)		(0.0017)	(0.0004)
Father's Educ		0.0257***	0.0247***		0.0168***	0.0185***
		(0.0016)	(0.0004)		(0.0016)	(0.0004)
Father Died when Child < 18 interacted with:						
Mother's Educ	0.0360***	0.0109**	0.0097**	0.0264***	0.0066	0.0058
	(0.0039)	(0.0044)	(0.0039)	(0.0040)	(0.0044)	(0.0038)
Father's Educ	0.0086***	-0.0178***	-0.0166***	0.0086**	-0.0110***	-0.0121***
	(0.0033)	(0.0039)	(0.0033)	(0.0034)	(0.0039)	(0.0033)
Mother's Educ*Age of Child when Father Died	-0.0003	-0.0004	-0.0003	-0.0001	-0.0003	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Father's Educ*Age of Child when Father Died	0.0007***	0.0007***	0.0007***	0.0005	0.0006**	0.0006**
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Age of Child when Father Died	-0.0059**	-0.0056*	-0.0062**	-0.0051*	-0.0053*	-0.0062**
	(0.0029)	(0.0030)	(0.0029)	(0.0030)	(0.0031)	(0.0029)
Observations	16383	32909	298522	15096	30446	278923
Number of School Fixed-Effects	None	None	None	830	873	1088
Sample	Dad Loss < 18	Dad Loss Any Age	All	Dad Loss < 18	Dad Loss Any Age	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions are performed using OLS and include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 15: Father Loss Analysis with Parental Wages in the Specification

	Students Whose Mother and Father Were Alive in 1988							
	Including Dropouts Before 12th Grade				With School Fixed Effects Not Including Dropouts Before 12th Grade			
Dependant Variable: Pass Matriculation Exam	All		Students with Non-zero Income for Both Parents		All		Students with Non-zero Income for Both Parents	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Father Died	-0.0319***	-0.0281***	-0.0343***	-0.0279***	-0.0247***	-0.0219***	-0.0267***	-0.0224***
	(0.0038)	(0.0038)	(0.0058)	(0.0058)	(0.0037)	(0.0037)	(0.0056)	(0.0056)
Father Died when Child < 18	0.0924	0.1028	0.1745	0.5925**	0.1147	0.1357	0.1899	0.5126*
	(0.0774)	(0.0937)	(0.1306)	(0.2928)	(0.0786)	(0.0949)	(0.1302)	(0.2861)
Mother's Educ	0.0266***	0.0243***	0.0251***	0.0228***	0.0209***	0.0192***	0.0194***	0.0179***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0006)	(0.0006)
Father's Educ	0.0246***	0.0230***	0.0250***	0.0231***	0.0185***	0.0174***	0.0182***	0.0170***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0005)	(0.0005)
Mother's Log Income 1988		0.0206***		0.0227***		0.0149***		0.0168***
		(0.0009)		(0.0010)		(0.0008)		(0.0010)
Father's Log Income 1988		0.0338***		0.0363***		0.0245***		0.0264***
		(0.0010)		(0.0013)		(0.0010)		(0.0013)
Mother's Income is Zero in 1988		0.1384***				0.0994***		
		(0.0078)				(0.0077)		
Father's Income is Zero in 1988		0.3158***				0.2282***		
		(0.0102)				(0.0101)		
Father Died when Child < 18 interacted with:								
Mother's Educ	0.0145*	0.0120	0.0084	0.0111	0.0073	0.0064	0.0039	0.0058
	(0.0076)	(0.0077)	(0.0116)	(0.0117)	(0.0076)	(0.0077)	(0.0114)	(0.0115)
Father's Educ	-0.0198***	-0.0176***	-0.0180*	-0.0161	-0.0150**	-0.0138**	-0.0164*	-0.0152
	(0.0067)	(0.0066)	(0.0103)	(0.0103)	(0.0066)	(0.0066)	(0.0099)	(0.0099)
Mother's Educ*Age of Child when Father Died	-0.0006	-0.0005	0.0003	0.0000	-0.0003	-0.0003	0.0005	0.0003
	(0.0005)	(0.0005)	(0.0008)	(0.0008)	(0.0005)	(0.0005)	(0.0008)	(0.0008)
Father's Educ*Age of Child when Father Died	0.0009*	0.0008	0.0007	0.0006	0.0008	0.0007	0.0007	0.0006
	(0.0005)	(0.0005)	(0.0007)	(0.0007)	(0.0005)	(0.0005)	(0.0007)	(0.0007)
Age of Child when Father Died	-0.006	-0.0063	-0.0153*	-0.0366*	-0.0084	-0.0090*	-0.0172*	-0.0346*
	(0.0052)	(0.0053)	(0.0088)	(0.0200)	(0.0053)	(0.0054)	(0.0088)	(0.0195)
Mother's Log Income 1988		0.0006		-0.0286		0.0005		-0.0166
		(0.0059)		(0.0213)		(0.0059)		(0.0206)
Father's Log Income 1988		-0.0017		-0.0224		-0.004		-0.0216
		(0.0059)		(0.0245)		(0.0058)		(0.0238)
Mother's Log Income 1988*Age of Child when Father Died		0.0002		0.0017		0.0002		0.001
		(0.0003)		(0.0015)		(0.0003)		(0.0014)
Father's Log Income 1988*Age of Child when Father Died		0.0000		0.0010		0.0001		0.0012
		(0.0003)		(0.0017)		(0.0003)		(0.0016)
Mother's Income is Zero in 1988		0.0264				0.0155		
		(0.0376)				(0.0373)		
Father's Income is Zero in 1988		-0.0305				-0.024		
		(0.0440)				(0.0440)		
Observations	294207	294207	134024	134024	274872	274872	126888	126888
Number of School Fixed-Effects	None	None	None	None	1088	1088	1041	1041

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 16: Placebo Analysis using those that Lost a Father Above the Age of 18

Dependant Variable: Pass Matriculation Exam	All Who Did Not Lose Mother or Father	Students who Lost a Father when Student was Above Age 18 (and Mother alive)					
	Including Dropouts Before 12th Grade	Including Dropouts Before 12th Grade			Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mother's Educ	0.0264***	0.0267***	0.0377***	0.0320**	0.0284**	0.0188	0.0152
	(0.000)	(0.0017)	(0.0128)	(0.0130)	(0.0134)	(0.0128)	(0.0129)
Father's Educ	0.0245***	0.0254***	0.0101	0.0078	0.0123	0.0118	0.0118
	(0.000)	(0.0016)	(0.0123)	(0.0124)	(0.0129)	(0.0123)	(0.0123)
Mother's Educ*Age of Child when Father Died			-0.0005	-0.0004	-0.0001	0.0000	0.0001
			(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0005)
Father's Educ*Age of Child when Father Died			0.0007	0.0007	0.0006	0.0002	0.0001
			(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Age of Child when Father Died			-0.0079*	-0.0080*	-0.0114**	-0.0080*	-0.0093*
			(0.0047)	(0.0048)	(0.0050)	(0.0047)	(0.0048)
Mother's Log Income 1988				0.0343***			0.0209***
				(0.0073)			(0.0074)
Father's Log Income 1988				0.0297***			0.0149**
				(0.0071)			(0.0071)
Mother's Income is Zero in 1988				0.1971***			0.1342***
				(0.0342)			(0.0350)
Father's Income is Zero in 1988				0.2879***			0.1957***
				(0.0391)			(0.0395)
Mother's Log Income 1988*Age of Child when Father Died				-0.0003			-0.0001
				(0.0003)			(0.0003)
Father's Log Income 1988*Age of Child when Father Died				0			0.0003
				(0.0003)			(0.0002)
Observations	259284	16246	16246	16246	15082	15082	15082
Number of School Fixed-Effects	None	None	None	None	None	693	693

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 17: Father Loss Analysis - Examining the Effect on Taking the Matriculation Exam

	Dependent Variable: Passing or Taking the Matriculation Exam					
	Pass	Pass	Take	Pass	Pass	Take
				With School Fixed Effects		
	Including Dropouts Before 12th Grade			Not Including Dropouts Before 12th Grade		
	(1)	(2)	(3)	(4)	(5)	(6)
Father Died	-0.0315***	-0.0234***	-0.0288***	-0.0243***	-0.0189***	-0.0184***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Father Died when Child < 18	0.0908**	0.0981**	-0.029	0.0769**	0.0764*	-0.033
	(0.038)	(0.046)	(0.032)	(0.038)	(0.045)	(0.027)
Mother's Educ	0.0266***	0.0186***	0.0189***	0.0209***	0.0157***	0.0120***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
Father's Educ	0.0247***	0.0188***	0.0147***	0.0185***	0.0152***	0.0082***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father Died when Child < 18 interacted with:						
Mother's Educ	0.0097**	0.005	0.0114***	0.006	0.005	0.0054**
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Father's Educ	-0.0166***	-0.0126***	-0.0083***	-0.0121***	-0.0113***	-0.002
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.002)
Mother's Educ*Age of Child when Father Died	-0.0003	-0.0001	-0.0003	-0.0002	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ*Age of Child when Father Died	0.0007***	0.0006**	0.0004*	0.0006**	0.0005*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age of Child when Father Died	-0.0062**	-0.0079**	-0.002	-0.0062**	-0.0058*	-0.002
	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)
Observations	298522	235882	298522	278923	235882	278923
Number of School Fixed-Effects	None	None	None	1088	1050	1088
Sample	All	Only Takers	All	All	Only Takers	All

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 18: Father Loss Analysis - Results using Different Subjects as Outcomes

	Dependent Variable								
	Pass Matriculation	Math > 80	Math > 70	Hebrew > 80	Hebrew > 70	Bible > 80	Bible > 70	English > 80	English > 70
	Sample: All Students (n=298522) including dropouts before 12th Grade								
Father Died	-0.031***	-0.0231***	-0.0315***	-0.0130***	-0.0246***	-0.0112***	-0.0242***	-0.0156***	-0.0276***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
Father Died when Child < 18	0.091**	0.1065***	0.1378***	0.1580***	0.1039***	0.1071***	0.060	0.1509***	0.1458***
	(0.038)	(0.037)	(0.038)	(0.033)	(0.037)	(0.032)	(0.037)	(0.033)	(0.038)
Mother's Educ	0.027***	0.0195***	0.0235***	0.0221***	0.0297***	0.0182***	0.0259***	0.0194***	0.0260***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ	0.025***	0.0200***	0.0229***	0.0217***	0.0271***	0.0177***	0.0239***	0.0215***	0.0240***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father Died when Child < 18 interacted with:									
Mother's Educ	0.010**	0.0082**	0.0086**	0.003	0.0083**	0.0064**	0.0094**	0.0110***	0.0069*
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
Father's Educ	-0.017***	-0.0158***	-0.0184***	-0.0163***	-0.0156***	-0.0158***	-0.0136***	-0.0228***	-0.0175***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mother's Educ*Age of Child when Father Died	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.0007**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ*Age of Child when Father Died	0.001***	0.0007***	0.0008***	0.0007***	0.0007**	0.0007***	0.0005**	0.0010***	0.0007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age of Child when Father Died	-0.006**	-0.0059**	-0.0089***	-0.0087***	-0.0085***	-0.0051**	-0.003	-0.0059**	-0.0090***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
	Sample: Not Including dropouts before 12th Grade (n=278923) with 1088 School Fixed-Effects								
Father Died	-0.024***	-0.0175***	-0.0243***	-0.0099***	-0.0172***	-0.0080**	-0.0178***	-0.0128***	-0.0211***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
Father Died when Child < 18	0.077**	0.1044***	0.1402***	0.1508***	0.0907**	0.1044***	0.045	0.1507***	0.1464***
	(0.038)	(0.038)	(0.039)	(0.034)	(0.037)	(0.034)	(0.038)	(0.035)	(0.038)
Mother's Educ	0.021***	0.0150***	0.0177***	0.0192***	0.0233***	0.0156***	0.0206***	0.0168***	0.0207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ	0.018***	0.0151***	0.0166***	0.0184***	0.0203***	0.0149***	0.0182***	0.0193***	0.0191***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father Died when Child < 18 interacted with:									
Mother's Educ	0.006	0.005	0.004	0.001	0.005	0.005	0.0067*	0.0094***	0.003
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Father's Educ	-0.012***	-0.0130***	-0.0143***	-0.0148***	-0.0122***	-0.0148***	-0.0107***	-0.0215***	-0.0139***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mother's Educ*Age of Child when Father Died	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.0006**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's Educ*Age of Child when Father Died	0.001**	0.0006**	0.0007***	0.0007***	0.0006**	0.0007***	0.0005*	0.0010***	0.0006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age of Child when Father Died	-0.006**	-0.0062**	-0.0097***	-0.0090***	-0.0089***	-0.0053**	-0.003	-0.0064**	-0.0098***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Table 19: Father Loss Analysis for Boys and Girls Separately

With School Fixed Effects

Dependant Variable: Pass Matriculation Exam	Including Dropouts Before 12th Grade				Not Including Dropouts Before 12th Grade			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Father Died	-0.029***	-0.035***	-0.028***	-0.035***	-0.022***	-0.025***	-0.022***	-0.025***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Father Died when Child < 18	-0.008	0.000	0.093*	0.080	-0.014*	-0.009	0.071	0.066
	(0.007)	(0.007)	(0.055)	(0.054)	(0.007)	(0.007)	(0.056)	(0.052)
Mother's Educ	0.027***	0.027***	0.027***	0.026***	0.021***	0.021***	0.020***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Father's Educ	0.025***	0.023***	0.026***	0.024***	0.019***	0.017***	0.019***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Father Died when Child < 18 interacted with:								
Mother's Educ			0.003	0.016***			0.002	0.009*
			(0.006)	(0.005)			(0.006)	(0.005)
Father's Educ			-0.011**	-0.021***			-0.009*	-0.014***
			(0.005)	(0.004)			(0.005)	(0.004)
Mother's Educ*Age of Child when Father Died			0.000	-0.001*			0.000	0.000
			(0.000)	(0.000)			(0.000)	(0.000)
Father's Educ*Age of Child when Father Died			0.000	0.001***			0.000	0.001**
			(0.000)	(0.000)			(0.000)	(0.000)
Age of Child when Father Died			-0.006	-0.006			-0.006	-0.005
			(0.004)	(0.004)			(0.004)	(0.004)
Observations	146823	151699	146823	151699	133099	145824	133099	145824
Number of School Fixed-Effects	None	None	None	None	1050	1045	1050	1045
Sample	All Boys or Girls				All Boys or Girls			

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. All regressions include mother's age at the time of the child's birth, father's age at the time of the child's birth, a dummy for being male, number of siblings, dummy variables for each cohort year, and dummy variables for each birth order among all siblings in the family (oldest, second oldest, etc).

Appendix Table 1: Causes of Parental Deaths

	Mother Loss before Age 18		Father Loss before Age 18	
	Frequency	Percent of Non-Missing Cause of Deaths	Frequency	Percent of Non-Missing Cause of Deaths
Infections	66	1.23	53	0.39
Neoplasms	3,574	66.42	4,007	29.71
Endocrine	68	1.26	321	2.38
Blood Disease	23	0.43	35	0.26
Mental	70	1.30	317	2.35
Nervous System	29	0.54	74	0.55
Circulatory	496	9.22	3,719	27.58
Respiratory	85	1.58	354	2.62
Digestive	76	1.41	435	3.23
Urinary	37	0.69	156	1.16
Pregnancy	40	0.74		
Skin	3	0.06	7	0.05
Musculatory-Skeletal	22	0.41	19	0.14
Congenital	12	0.22	28	0.21
Unknown Illness	178	3.31	1,146	8.50
Traffic Accident	208	3.87	925	6.86
Self-harm	148	2.75	579	4.29
Assault	41	0.76	162	1.20
War	13	0.24	94	0.70
Other Unnatural Cause	192	3.57	1,055	7.82
Frequency of Missing Cause of Death	844		2900	
Fraction of Deaths with Missing Cause of Death	0.14		0.18	

Appendix Table 2: Nonlinear Controls for Age of Parental Death and Probit Analysis

	Mother Loss Analysis			Father Loss Analysis		
Dependant Variable: Pass Matriculation Exam	OLS	OLS	Probit	OLS	OLS	Probit
	(1)	(2)	(3)	(4)	(5)	(6)
Parent Died when Child < 18 interacted with:						
Mother's Educ	-0.0304***	-0.0300***	-0.0370***	0.0097**	0.0098**	0.0101**
	(0.0059)	(0.0059)	(0.0068)	(0.0039)	(0.0039)	(0.0045)
Father's Educ	0.0120*	0.0125*	0.0131*	-0.0166***	-0.0165***	-0.0195***
	(0.0064)	(0.0064)	(0.0075)	(0.0033)	(0.0033)	(0.0038)
Mother's Educ*Age of Child when Parent Died	0.0022***	0.0022***	0.0027***	-0.0003	-0.0003	-0.0002
	(0.0005)	(0.0005)	(0.0006)	(0.0003)	(0.0003)	(0.0004)
Father's Educ*Age of Child when Parent Died	-0.0010**	-0.0011**	-0.0012**	0.0007***	0.0007***	0.0009***
	(0.0005)	(0.0005)	(0.0006)	(0.0003)	(0.0003)	(0.0003)
Age of Child when Parent Died	-0.0182***		-0.0224***	-0.0062**		-0.0087**
	(0.0051)		(0.0061)	(0.0029)		(0.0035)
Dummy For Each Age that a Parent Died	No	Yes	No	No	Yes	No
Observations	288526	288526	288515	298522	298522	298521

Notes: Standard errors appear in parentheses. Significance levels are indicated by one, two, or three stars which represent 10 percent, 5 percent, and 1 percent levels, respectively. The sample includes those that dropped about before the age of 18. The probit specifications report marginal effects evaluated at the means. The left panel uses a sample of only those that did not lose a father below the age of 18, while the right panel uses a sample of only those that did not lose a mother below the age of 18. All regressions are specified with the same variables used in the main analysis of maternal or parental death (Table 4 for maternal loss and Table 14 for paternal loss).