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ARE CHILDREN'S SOCIO-EMOTIONAL SKILLS SHAPED BY PARENTAL HEALTH SHOCKS?

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Are Children's Socio-Emotional Skills Shaped by Parental Health Shocks?

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Abstract

Child skills are shaped by parental investments. When parents experience a health shock, their investments and therefore their children's skills may be affected. This paper estimates causal effects of severe parental health shocks on child socio-emotional skills. Drawing on a large-scale survey linked to hospital records, we find that socio-emotional skills of 11-16 year-olds are robust to parental health shocks, with the exception of significant but very small reductions in Conscientiousness. We study short-run effects with a child-fixed effects model, and dynamics around the shocks with event studies. A sibling comparison suggests some long-run build-up of effects of early shocks.

JEL Classification: J24, I10, I21.

Keywords: Big Five personality traits, development of personality traits, parental health shocks, socio-emotional skills, non-cognitive skills, skill formation

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1 Introduction

Socio-emotional skills, often measured with personality traits, are important determinants of life outcomes. Conscientiousness, for example, demonstrably affects educational performance and attainment (Poropat, 2009), as well as productivity and earnings (Cubel et al., 2016; Fletcher, 2013; Gensowski, 2018; Heineck and Anger, 2010; Mueller and Plug, 2006; Nyhus and Pons, 2005). Several traits also influence healthy living and health outcomes (Roberts et al., 2014). Agreeableness has been linked to economic preferences, such as reciprocity and altruism (Becker et al., 2012), or prosociality (Hilbig et al., 2014). Neuroticism, the reverse of Emotional Stability, is associated with mental health problems and lack of emotional wellbeing (Widinger, 2011), as it reflects the ability to bounce back from negative experiences or to dwell on the past. Overall, these traits are essential building blocks to a healthy and happy life. Importantly, even early childhood personality traits predict major life outcomes (Moffitt et al., 2011).

The formation of all skills, including socio-emotional skills, depends to a large extent on parents (Cunha and Heckman, 2007). Parents invest actively and passively, using their knowledge, resources, energy and time. Therefore parental health could influence the skill acquisition of their children. But whether ill health necessarily decreases child skills is ambiguous. A sick parent might need to be at the hospital, leading to a reduction in the quantity of time available for the child. At the same time, if the illness reduces a parent's work hours, it could also increase the time spent with their children. The quality of time can also be affected, presumably negatively, by a parental illness. Illness can also affect parental financial resources or other labor market outcomes. Children's socio-emotional skills can also be directly affected by the exposure to parental weaknesses, stress, and lack of control over life events. These experiences may even translate to long-run changes in socio-emotional skills if children react to them by adopting different views of their own social roles in a contextual model of personality (Roberts et al., 2006). It is thus conceivable that long-run effects of even temporary health shocks to parents translate to larger differences in socio-emotional skills over time. Alternatively, parents may be able to compensate for lower investments during a health shock, and thus mitigate long-run effects through life-cycle investments (Bharadwaj et al., 2017). Again, there are several channels through which parental health shocks can influence child skills, without a clear expectation for whether ill health would have larger long-run or short-run effects. Despite all these relevant channels through which parental health shocks potentially affect child socio-emotional skills, there is surprisingly little empirical evidence.

This paper estimates causal effects of parental health shocks on children's socio-emotional skills. We contribute to the existing knowledge on this topic in four ways: Firstly, we obtain causal effects using three different estimation strategies that address the main identification challenges of selection and reverse causality. Secondly, we estimate the short-run effects of shocks and provide complementary evidence on long-run effects. Thirdly, our data offers an ideal setting to observe any detrimental effects of parental shocks on child skills: it uses severe shocks, and observes productive socio-emotional skills of children (not only socio-emotional malfunctioning) at an age where one expects most malleability and influence of parents. Finally, we test for heterogeneous effects of these shocks by sex of the parent and child, and family socio-economic status (SES).

The usual identification challenges when estimating the effects of parental health shocks on child skills are threefold. First, parent and child outcomes are correlated due to underlying genes and a shared environment, leading to sample selection—parental shocks are not randomly distributed among children. Second, there is a measurement problem that carries the risk of picking up reverse causality: if the child's socio-emotional skills are reported by the parents, it is possible that parents who are ill score their children lower than they would otherwise (so that their reports do not correctly reflect the child's skills). Third, another type of reverse causality can occur if socio-emotional problems of the child cause worse parental health self-reports, or objectively worse parental health.

We overcome these identification difficulties by using fixed effects estimations that draw on third-party reported, objective parental health shocks that are unlikely to be influenced by child socio-emotional problems, and socio-emotional skill measures that are self-reported by the children. Specifically, we employ three separate empirical strategies that identify the short-run effects of the shocks with great precision (controlling for child fixed effects), the dynamics before and after the shock (event studies), and long-run effects of the shocks (sibling-pair comparisons, or parent fixed effects).

We construct a unique dataset by combining administrative records on parental health with a large-scale survey on children socio-emotional skills. We exploit a population-wide sample of rich administrative data that includes third-party records of parental health in the Danish population. Parents' health shocks are observed as diagnoses for hospitalizations due to cardiovascular shocks, cancer, mental health problems, and also include parental deaths. This is merged to a validated survey panel of socio-emotional skill outcomes for the children that was distributed in all public schools for the period 2015-2018.

Our paper adds to a short list of previous studies that have found mixed results of changes in parental self-reported health on child personality or problem behavior, ranging from negative effects (Mühlenweg et al., 2016; Cuadros-Menaca et al., 2018) to no effects (Le and Nguyen, 2017). Our empirical setting should be in the best position to identify any effect, because we consider objective health shocks that are arguably more severe than changes in self-reported health. So if there are dosage effects (more severe shocks generate greater responses in children), one would expect the effects to be larger in our study. Furthermore, children in our sample are slightly older than children in the existing studies, so we observe them at a time when socio-emotional skills fully develop (McCrae and Costa Jr., 1996), yet where they still depend greatly on parental investments. This would also tend to increase the estimated effect sizes.

Our findings show that socio-emotional skills of children (aged 11-16) are only weakly affected in the immediate aftermath of severe parental shocks, up to 3 years later. Conscientiousness, one of the most important traits, is reduced by .05% of a standard deviation from losing a parent, and .02% of a standard deviation from the health shocks considered jointly. There are no significant effects on Agreeableness, Emotional Stability, or Academic Self-Concept from these two events. The fact that children's socio-emotional skills are so robust to shocks to their parents' health is surprising, given that we are studying the stability of traits at a time of their lives during which we expect both most malleability and the greatest influence from parents, and using severe, objective health shocks.

With 95% confidence, we can rule out effects larger than 4% of a standard deviation for the parental health shocks considered jointly, or 10% of a standard deviation for parental deaths. This is much smaller than the SES gaps we find for the different traits (.12-.29% of a standard deviation for parents having college education, for example). We perform a back-of-the-envelope calculation that extrapolates these effects to adulthood and links them to reported wage returns to personality traits.From this exercise, we can exclude that a parent passing away (the most extreme shock) would have more harmful effects on yearly earnings than a reduction of 0.41%, or reduce educational attainment by more than 0.002 of a standard deviation.

We test whether the effects of shocks are larger among boys or girls, whether it matters that they happen to the father or the mother, and whether children of single mothers or low-income mothers are more vulnerable. Generally, there are no consistent patterns that would suggest a specific at-risk group.

We complement our analysis of the effects of parental shocks on children in the short run with a strategy that compares siblings, allowing us to identify the long-run effects from experiencing a shock earlier in life, while controlling for parental fixed effects. These long-run analyses, which must be interpreted with caution due to the small sample size used for the estimation and the different interpretation of the estimates as within-family timing effects, point to the existence of long run effects. Parental health shocks reduce Conscientiousness and Emotional Stability if they occur earlier in the child's life.

2 Existing Literature

The existing literature that studies the effect of parental health on children focuses mostly on how childrens' health and educational outcomes are affected (see, for example, Currie and Moretti, 2007; Bhalotra and Rawlings, 2011; Kristiansen, 2020). Some research has shown associations between parental health and child educational outcomes in the US (Andrews and Logan, 2010, using the ECLS-K; or Johnson and Reynolds, 2013 using the NLSY), while many papers use data from developing countries (such as Senne, 2014; Dhanaraj, 2016; Alam, 2015) or transition countries (Bratti and Mendola, 2014).

Yet educational attainment is an outcome that is the result of investments and skill formation throughout the child's life. Socio-emotional skills, often referred to as non-cognitive skills, are essential building blocks to further educational attainment (see, e.g., Cunha and Heckman, 2007; Almlund et al., 2011; Lundberg, 2013, 2019). These skills also have a direct impact on later outcomes in life, such as income and health (Almlund et al., 2011; Fletcher, 2013; Gensowski, 2018; Heineck and Anger, 2010; Mueller and Plug, 2006; Roberts et al., 2014; Spengler et al., 2016).

There is only very little evidence on how parental health shocks affect child socio-emotional skills. As far as we are aware, there are only two peer-reviewed studies analyzing the effect of parental health shocks on child socio-emotional functioning on the Strengths and Difficulties

Questionnaire (SDQ) measure.[1]

Mühlenweg et al. (2016) use the mother-child sample from the German Socio-economic Panel to study determinants of child socio-emotional skills at age 6, with 639 observations. Their identification strategy is to control for initial child characteristics (including prenatal conditions), and to interpret major changes in self-reported parental health as a health shock. The measure of child socio-emotional skills is the SDQ reported by the mother. This measure focuses mainly on the malfunctioning end of socio-emotional skills rather than on productive traits, as it has been widely used for psychopathological screening (Becker et al., 2006). Mühlenweg et al. (2016) find rather large effects of *maternal* health shocks (no effects of paternal shocks). When the mother's self-reported health decreases, or her number of nights at the hospital increase, the child displays .4-.9 standard deviations more socio-emotional difficulties (a combination of emotional symptoms, conduct problems, hyperactivity and inattention, and peer-relationship problems). These effects are not only statistically significant but also rather large. Yet, there is a remaining risk that they reflect not only the true effect of the shock but also initial differences between families where the mother experiences worsening health versus families where her health stays constant, when these differences are not captured by observable initial child characteristics.

Le and Nguyen (2017) do not risk this selection problem, as they employ a child fixed estimation. They exploit the Australian LSAC panel data, with children between ages 4 and 13, whose socio-emotional skills are also assessed with the SDQ. Their measure of parental health is based on self-reported answers including health status, mental health episodes and other self-reported symptoms. They demonstrate how large negative effects of shocks from OLS regressions disappear when using child fixed effects. Instead, they find only "little detrimental effects of poor parental health on cognitive and non-cognitive skills." Among all tested relationships, the only significant effect on child behavior was serious paternal mental health problems that increased the probability of hyperactivity. In a heterogeneity analysis, it appeared that single mothers' mental health also influenced the child SDQ.

Using parent-reported measures of children's socio-emotional skills can introduce a first problem of reverse causality in measurement: parents whose health suddenly declined may consequently evaluate their child's skills as less favorable—simply because they experienced a health shock, not

[1] There is also some evidence presented in Cuadros-Menaca et al. (2018), who use an Indonesian panel data from the IFLS, with two personality traits of Conscientiousness and Neuroticism observed in the last wave at around age 24. Using sibling fixed effects, they find no effects of parental health deterioration on these two traits.

because their child's skills have actually changed. Le and Nguyen (2017) address this problem by using teacher-reported information on the children's socio-emotional skills. They show that using parent-reported information may over-estimate the effects of parental health shocks. In this paper, we also avoid this risk of reverse causality by using child-reported information on their own socio-emotional skills.

A second risk of reverse causality comes from the use of parent self-reported measures of their own health. If a child is experiencing socio-emotional problems, this might have an effect in the self-reported health measures of the parents, who might report worse conditions because of their child's behavior even if their actual health is unaffected. We address this by using health shocks that are third-party reported by medical professionals and that can be objectively measured. A third risk of reverse causality would occur if child's socio-emotional skills (or their problematic behavior) actually affect parental health. While we cannot solve this problem with econometric techniques, we argue that it is unlikely for a child's personality traits to influence the objective measures of severe health shocks we consider, such as a cancer diagnosis or a heart attack.

We contribute to this emerging literature and the larger question of how the family environment shapes child skills by providing evidence from self-reported child personality traits and objective health measures for the parents. The health shocks are not simply defined as changes in self-reported health status from one survey wave to the next, but objective medical diagnoses of rather severe shocks. We also provide initial evidence for long-run effects of parental health shocks on child skills. It is unclear *ex ante* whether one should expect the effects of shocks to be attenuated or amplified in the longer run. On the one hand, parental shocks may have initial effects on the child skills that fade out over time. Some health shocks may only work as a temporary disruption of family life, if either the parent gets well again (such as after a heart attack that is successfully treated), or because parents and the child adapt to a new organization of life at home with the illness. For example, Cobb-Clark and Schurer (2013) and Elkins et al. (2017) did not find, in the context of personality traits, consistent effects of common family- or health-related shocks. Also, the "adaptation level" view from psychology has long suggested, both theoretically and empirically, that an individuals' happiness reverts to a baseline level and is not affected by shocks such as lottery wins in the long run (Brickman et al., 1978). To the extent that the parents' well-being bounces back, evidence on maternal life satisfaction indicates that children's socio-emotional skills should benefit as well (Berger and Spiess, 2011).

On the other hand, not all health shocks are temporary—and there are several mechanisms that could transform parental health shocks to persistent long-run changes in the child's socio-emotional skills. For one, even though happiness may bounce back to pre-shock levels, it may do so via a socialization process in which children "grow" with the challenges—and in doing so, alter their socio-emotional skills. In this view of the contextual model of personality, even short-run shocks can have permanent effects on child skills via socialization (Roberts et al., 2006). Also, life cycle skill formation is characterized by sensitive and even critical periods. Therefore, even though parents may actively invest in their child's socio-emotional skills after a health episode has passed to remediate negative initial effects, their efforts may be hampered: The shock may have occurred during such a sensitive or critical period in their child's life that remediation is costly or ineffective (Cunha and Heckman, 2007). If socio-emotional skills of a child were harmed from a temporary shock, this disadvantage may be aggravated later because of missed subsequent self-productivity and dynamic complementarity. Thus, the effects of a parental health shock on child skills may also accumulate over time.

3 Data and Samples of Analysis

We construct a unique dataset by combining several administrative registers for the entire population of Denmark with a nation-wide panel survey of children in public schools. The registers include third-party reported information on health, as well as information on education, socioeconomic variables, and family linkages, allowing us to match children to their siblings and parents. This provides us with a panel of observations that follows the children, their siblings and their parents for potentially their entire lifespan.

3.1 Parental Shocks

Health shocks are identified in the National Patient Registry, which covers hospitalizations from both private and public hospitals. It contains information on the exact date of admission, the duration of the hospitalization, and detailed diagnoses following the International Classification of Diseases and Related Health Problems (ICD-10 system).

We consider three types of health shocks: **Cardiovascular** shocks, including myocardial infarction of the heart or brain; **Cancer** diagnoses, including malignant cancers of any type; and

Mental health episodes that require hospitalization.[2] We also aggregate the three aforementioned health shocks into a variable called **Any Health Shock**. We use the first occurrence of each health shock by restricting them to shocks that have not been preceded by the same type of diagnosis in the previous 5 years.

Mortality shocks are identified using administrative registers that contain information on the exact date of the event. There is of course a large number of deaths that are preceded by a health shock. We try to address this with further restrictions that depend on each sample of analysis. They are laid out in Section 3.3.

Parental background is measured with information from the administrative registers. In addition to parental gender, we use information on mother's income and her cohabitation status with the child's father. The child's parents in the registers are defined as the biological parents or legal parents in case of adoptions. For some children, the registers do not list the personal identifier of both mother or father, we include them as long as we have information on at least one parent. For the heterogeneity analyses, we focus on maternal characteristics (as there are very few children without a maternal personal identifier, less than 0.2%). We split the sample into mothers whose household per-capita disposable income is in the bottom quartile vs the top three. Disposable income is a variable provided by Statistics Denmark, taking into account each person's household income and size. Next, we observe whether a mother is cohabiting with, or married to, the biological father of the child. If she is not (either living alone or with another partner), she is classified as "single" for our heterogeneity analyses.

3.2 Child Personality

We obtain our measures of the outcome of interest, child socio-emotional skills, from four waves of a nation-wide survey of public school children, the "Danish Well-being Survey" (DWS)[3]. This survey was introduced in 2015, and until 2018 it was mandatory for all Danish public schools to administer this self-report survey. The survey therefore approaches representativeness at the national level and is less prone to sample selection problems than small voluntary samples.[4]

[2] The specific ICD-10 diagnoses that define each health shock are the following. Cardiovascular: I20-I24, I6. Cancer: C00-C97, D00-D09. Mental Health: F00-F99. Of the latter, around half are related to substance abuse, mostly alcohol. We found no differential effects between substance-abuse related and other mental health hospitalizations.

[3] For general information, see https://emu.dk/grundskole/undervisningsmiljo/trivselsmaling.

[4] It was typically administered during a regular school class in the school's computer room, led by a designated teacher. Schools had to upload the data according to certain standards, which included that all questionnaires

Public schools ("Folkeskole") cover grades 0-9, and we use the survey version given to older students, grade 4-9 (about age 11-16). The three traits of Conscientiousness, Agreeableness, and Emotional Stability, as well as Academic Self-Concept, can be measured with selected items (questions) from the survey, as shown by Andersen et al. (2015, 2020). Not only do the items have good internal consistency, but they also correlate well with the relevant items from the Big Five Inventory (John and Srivastava, 1999), as demonstrated in a validation study with a separate data collection in Andersen et al. (2020). The survey remained the same throughout the period, there was only a re-ordering of questions between 2015 and 2016. Thus, we have an unbalanced panel structure, for which we construct the following four scores that measure the otherwise unobserved personality traits:

Conscientiousness, or how *responsible, and careful* one behaves, and one's tendency to *finish work*, is measured with the items "I can complete tasks and projects that I've committed to," "During class, I can concentrate well," "If interrupted during class, I can quickly concentrate again" (Cronbach's α measure of reliability in the full DWS sample, pooled over ages: $\alpha = .69$).[5] **Agreeableness**, reflecting *cooperation and empathy*, draws on "I try to understand my friends' feelings when they are sad or upset," and "I am good at collaborating with others" ($\alpha = .40$). Neuroticism (the reverse of **Emotional Stability**) reflects *vulnerability to stress.* We use the items "I often feel lonely," "My fellow students accept me for who I am," and "I always feel safe at school" ($\alpha = .70$). **Academic Self-Concept** is assessed by "I am doing well academically in school" and "I am making good academic progress in school" ($\alpha = .80$). This trait is not part of the Big Five, but it is predictive of future academic progress (Gensowski et al., 2020).

To measure personality traits, we generate four scores for each individual by first standardizing all items individually to mean zero and standard deviation one, by child's gender, grade, and calendar year, and second, forming the simple average and re-standardizing them. Using these standardized dependent variables means that the estimated coefficients can be interpreted as effects in terms of percentages of a standard deviation. The standardization helps us identify the effects of parental health shocks that are not influenced by other mechanisms that may be happening simultaneously. First, it is well documented in the literature that personality traits display typical developmental maturation patterns, which are changes in traits that appear

should be linked to the students' national identification number. We are therefore able to combine the survey data with data described above on parental health shocks.

[5]The corresponding Cronbach's alphas for the sub-sample of respondents who experience a parental health shock are equivalent or higher: Conscientiousness $\alpha = .70$, Agreeableness $\alpha = .43$, Emotional Stability $\alpha = .71$, Academic Self-Concept $\alpha = .81$.

consistently with age (see, for example van den Akker et al., 2014; Soto, 2016). Adolescence, in particular, is a time during which there are distinct decreases (dips) in Conscientiousness and Agreeableness (Soto et al., 2011) and academic self-esteem (Gensowski et al., 2020). In the context of our analyses, we worry that by comparing personality traits measured after a shock to those measured before the shock, we confound the effect of the shock with spurious age-related differences that reflect overall maturation patterns. The standardization by school grade avoids picking up these spurious effects. Sex effects are also present (Soto et al., 2011), thus standardizing by sex (together with grade) removes differential developments over time by sex. The standardization by year takes out survey-wave specific effects (such as, for example, the re-ordering of items from 2015 to 2016).

3.3 Samples of Analysis

We report the descriptive statistics for the full sample of respondents to the DWS, compared to the two samples of analysis that we introduce below, in Table 1.

Short-run analyses. For the short run analyses, we exploit the panel dimension of the well-being survey data available from 2015 to 2018. Each year there were about 260,000 survey responses.[6] This amounts to 1,026,664 child-year observations from 457,227 children for whom we observe the four socio-emotional skills of interest.

We obtain individual-level variation within each child by restricting the sample of analysis to children who experience a parental shock in between any two DWS waves. We observe both the exact date of the survey and of the shock, so there is a very low probability of assigning the timing of the shock wrong. We only consider health shocks where the parent who experienced the health shock survived at least one year. Otherwise, the shock is considered a mortality shock and assigned to the year where the death occurred. Note that some health shocks might be preceded by symptoms that could affect the child in anticipation. While this is likely the case for mental health, the occurrence of a stroke or a cancer diagnosis is likely to come unexpectedly (Fadlon and Nielsen, 2020). Our analysis allows us to test for these anticipation effects, which could be different depending on the type of shock.

Our sample of analysis contains 10,904 unique children who experience a parental shock and

[6] Precise numbers are 2015: 242,380, 2016: 268,047, 2017: 265,935, 2018: 250,302.

Table 1: Descriptive Statistics

	DWS Sample		Shocked Short-run	Shocked Long-run
	Mean	S.D.	Difference	Difference
Conscientiousness	0.000	1.000	−0.040***	−0.025
Agreeableness	0.000	1.000	−0.002	−0.033**
Emot.Stability	0.000	1.000	0.008	0.005
Acad.Self-Concept	0.000	1.000	−0.029***	−0.023
Age	13.531	1.739	0.117***	0.000
Female	0.491	0.500	0.006**	0.004
Parents College	0.501	0.500	−0.031***	−0.010
Mother Income Lowest Quar.	0.239	0.426	0.054***	0.119***
Single Mother	0.306	0.461	0.069***	0.039***
Cohort Mother	1972.6	5.049	−1.177***	0.141*
Observations	1 026 664		33 249	3 772

Note: Showing mean and standard deviations (S.D.) for the entire sample of children responding to the DWS 2015-2018 (DWS Sample) and the sub-samples of children who experienced a short-run shock (that occurred in between DWS waves) or a long-run shock (that occurred to sibling pairs before they reach age 15). The columns denoted "Difference" report t-tests of means for each shocked subsample, comparing to the full DWS Sample. Note that the long-run sample compares only children who are 15 years old in both samples. *($p < 0.10$),** ($p < 0.05$),*** ($p < 0.01$).

33,249 child-year observations. We identify 1,253 deaths and 9,679 health shocks of which 3,076 are cardiovascular shocks, 4,074 are cancer shocks, and 2,644 are mental health episodes.[7] These are on average 418 deaths per year and 3,226 combined health shocks per year.

In comparison to the full sample of DWS respondents, this sub-sample of children who experience a shock between any of the DWS waves scores less favorably on some socio-emotional skills, and is different in terms of parental background—see the third column of Table 1. We will discuss this further below.

Long-run analysis For the long-run analysis, we study the effect of the timing of parental shocks on children's socio-emotional skills measured at age 15,[8] with a parents fixed effects strategy. Hence, we keep all children who answered the DWS at age 15 (166,665 children) and focus on those who experienced a parental shock before age 15 (32,732 children).

We further restrict the sample to siblings (pairs or triplets) who have experienced the same parental shock at different ages (hence excluding twins). To avoid further reducing the sample

[7] The sum of the disaggregated health shocks is greater than the number of aggregated health shocks because if a child experiences different types of parental health shocks, such as a paternal cancer and a maternal cardiovascular shock, these shocks will both be considered separately for the disaggregated definitions, but when using the aggregated definition, only the earliest of those shocks will be included.

[8] We choose this age because it is the latest age with full sample size.

size, we consider all health shocks together and do not impose a survival period, therefore we identify the compounded effect of both the health shocks and any potential death that followed them. Importantly, we ensure that the health shock experienced by the siblings is the same, either cardiovascular, cancer, or mental health. The resulting sample of analysis contains 3,772 children.

The final column of Table 1 shows that this sub-sample differs from the full DWS sample in having less favourable socio-emotional skills, but it differs less than the short-run sample. This is explained by the less strict restriction of having experienced a parental shock over a much longer period of time. The differences are also less significant due to the small sample size.

4 Evidence for the Effects of Parental Health Shocks on Child Socio-emotional Skills

Children whose parents suffer a health shock have, on average, significantly less favorable socio-emotional skills than children of parents who do not, in terms of Conscientiousness and Academic Self-Concept (as shown in Table 1). A naive comparison of these two groups of children would lead us to conclude that parental health shocks produce large and significant differences in some socio-emotional traits in children. Yet, this comparison is flawed because parents who suffer from severe health shocks are different *ex ante*, and are likely to have children that differ *ex ante* as well, so that one cannot attribute differences in skills to the shocks. The naive comparison in Table 1 conflates the causal effect of a parental health shock with selection "into" the shocks.

4.1 Evidence on Short Run Effects

We exploit the panel dimension of the data on socio-emotional skills of the child and parent health, and employ two strategies to obtain causal effect estimates of the effect of parental health shocks on child socio-emotional skills.

4.1.1 OLS with Child Fixed Effects

The first strategy uses child-level fixed effects, identifying the effect of a parental health shock from within-child variation. Intuitively, this compares a child after a shock to him- or herself before the shock. The estimation model is:

$$Y_{it} = \alpha + \beta D_{it} + \phi_i + \epsilon_{it} \quad \text{for } t \in 2015, 2018 \tag{1}$$

where Y_{it} is child i's standardized trait at time t; D_it is an indicator variable that takes 1 from time t and onward if a parental shock took place between $t-1$ and t, and ϕ_i is an individual fixed effect. Under the assumption of no time-covarying unobservables, the parameter β identifies the causal effect of a parental shock on children's socio-emotional skills in the short-run. This strategy is comparable to Le and Nguyen (2017). It is a short-run measure in our setting because skills are observed until at most 3 years after the shock. Note also that β is not time-varying in the specification of Eq. (1), therefore capturing the average of the effects of the shock throughout the short-run post-shock period. (We allow for dynamics in our second strategy in the section below.)

Table 2: The Short Run Effect of Parental Shocks. Child Fixed Effects Estimates

	(1) Conscientiousn.	(2) Agreeablen.	(3) Emot.Stability	(4) Acad.Self-Concept	(5) # Shocks
Death	-0.049^{*}	-0.014	0.014	-0.028	1,253
	(0.03)	(0.03)	(0.03)	(0.03)	
Any Health Shock	-0.022^{**}	-0.001	-0.008	-0.004	9,679
	(0.01)	(0.01)	(0.01)	(0.01)	
Cardiovascular	-0.016	-0.034^{*}	0.013	-0.020	3,076
	(0.02)	(0.02)	(0.02)	(0.02)	
Cancer	-0.026^{*}	0.009	-0.011	0.014	4,074
	(0.01)	(0.01)	(0.01)	(0.01)	
Mental Health	-0.014	0.033^{*}	-0.013	-0.008	2,644
	(0.02)	(0.02)	(0.02)	(0.02)	

Note: Each cell reports the β coefficient of interest from estimating Eq. (1) separately for each personality trait of the children and for each type of parental shock. Each β coefficient identifies the causal effect of experiencing a given parental shock on the children's skills, which are standardized by child's sex, grade, and calendar year to have mean zero and standard deviation 1. Standard errors in parentheses clustered at the child level. $^{*}(p < 0.10),^{**}(p < 0.05),^{***}(p < 0.01)$.

Table 2 summarizes the results from estimating Eq. (1). The most severe shock, arguably, is that of a parent passing away. A parental death has a small significant effect on the child's Conscientiousness, reducing it by .05 of a standard deviation in the period following the death (one to three years after). This socio-emotional skill is similarly decreased (by over .02 of a standard deviation) from the summary measure of any health shock, particularly by cancer.

On the one hand, this finding is important because Conscientiousness is regarded as a "super trait"—it is associated with many productive outcomes in terms of education, the labor market, health, and others. On the other hand, the effects are objectively quite small.

At the same time, we also notice that the other three traits we measure in the DWS are *not* significantly reduced by the loss of a parent or an indicator for any of the three severe health shocks considered: Agreeableness, Emotional Stability, and Academic Self-Concept are not significantly affected. This finding points to children being remarkably robust to even drastic shocks to their parents' health. One would especially have expected Emotional Stability to react to these challenging events, but it is clearly not - some point estimates are even positive. Note that these findings hold despite a substantial sample size for each test, and that the shocks being considered are quite severe. They can be interpreted causally under the assumption that within children's repeated measurements, the shock does not coincide with other unobservable events.

We can exclude, with a 95% confidence bound, harmful effects for Emotional Stability of more than .03 of a standard deviation from Any Health Shock and .04 from parental mortality; and for Agreeableness and Academic Self-Concept we can exclude reductions of more than .02 and .08. Conscientiousness can be decreased by up to .10 of a standard deviation from parental death and .04 from Any Health Shock.

Note that there are two lessons from separating out Any Health Shock into its components of cardiovascular shocks, cancer and mental health diagnoses: First, Conscientiousness is significantly reduced from a cancer diagnosis, which seems to drive the overall finding. Second, the null finding for Agreeableness hides both a harmful effect of a cardiovascular shock (which reduces Agreeableness by .03 of a standard deviation) together with a *beneficial* effect from the parent having a mental health episode.

The overall conclusion we draw from Table 2 is that of relative robustness of children's socio-emotional skills, despite some moderately negative effects on Conscientiousness, and possibly Agreeableness. The reason is that even those significant effect sizes are relatively small—especially in comparison to other effect sizes that are known for personality traits. In our sample, for example, the gender gap in (standardized) Agreeableness is 38% of a standard deviation (higher for females), and females score on average 29% of a standard deviation lower on Emotional Stability (see Table S.1). Children of parents with at least some post-secondary education score 29% of a standard deviation higher on Conscientiousness than children of less educated parents. (The corresponding gaps in Agreeableness are 16%, Emotional Stability 12%, and Academic Self-Concept 27%). From the literature, the evidence on the effects of schooling and other interventions on personality traits also show that these effects are of a different magnitude. For example, increasing schooling from 12 to 13 or more years increases Self-esteem by more than 50% of a standard deviation (Heckman et al., 2006). Randomized interventions have been reported to boost socio-emotional skills by up to 57% of standard deviations (see summary in Almlund et al., 2011). In comparison to these findings, it seems that children's socio-emotional skills are only weakly affected by severe parental health shocks.

Since the detrimental effects of parental health shocks on child socio-emotional skills are rather small, they would also have small effects on other life outcomes of the child, such as earnings or education, if we were to do a simple extrapolation exercise. The summary presented in Almlund et al. (2011), for example, shows that the effect of Conscientiousness on years of schooling is up to .18 of a standard deviation, and of Emotional Stability .09. Thus, taking the short-run effects of Table 2, we could exclude greater reductions in education than .007 of a standard deviation in schooling from any parental health shock on Conscientiousness, and by .003 from Emotional Stability (because the lower bound is so small with the point estimate being positive). Almlund et al. (2011) also present estimates of the effects of standardized personality traits on earnings, where Conscientiousness increases log earnings by .041 and Emotional Stability by .036. Therefore, if the short-term effects of Any Health Shock in Table 2 persisted throughout the children's adult working lives, their annual earnings would decrease by no more than .098% (Conscientiousness) or .108% (Emotional Stability). Even from parental death would we not expect more detrimental effects than a reduction of education by 0.018 of a standard deviation via Conscientiousness, if the short-run effects of Table 2 were extrapolated to the longer term, and we would exclude larger wage effects than 0.41% from the mortality shock's effect on Conscientiousness.

4.1.2 Heterogeneity by Child and Parent Gender

It is possible that the overall results in Table 2, which pool both the sex of the child and of the parent, hide important heterogeneities. Fathers and mothers may differentially affect children's acquisition of the different socio-emotional skills. Mühlenweg et al. (2016) found mothers' health to be significantly more important for child skills (with no effect of fathers), and Le and Nguyen (2017) remarked on specifically paternal mental health being important. Additionally, there is a literature discussing the greater vulnerability of boys relative to girls in terms of family disadvantage (Autor et al., 2019; Brenøe and Lundberg, 2018), or showing that mothers' investments are more reactive to their own mental health status for their daughters than their sons (Baranov et al., 2020). Therefore, it is important to also split the sample of children by sex to test whether boys are affected more by parental health shocks than girls.

Table 3 shows effects on boys, and Table 4 on girls, of health shocks split by whether they occur to the mother or father.[9] We also report the interaction coefficient between health shock and child sex in Table S.2.

These heterogeneity analyses show that there are a few significant differences between shocks coming from the mother vs the father, and that boys are not generally affected more negatively than girls.

For boys, the harmful effect of a parental death on Conscientiousness is entirely driven by losing their father, as the point estimate of losing a mother is insignificant and positive. Similarly, the effects of health shocks are larger if they happened to boys' fathers (the interaction terms for the difference to mothers are all negative in column 3, without being statistically significant). The reduction in Agreeableness from a cardiovascular shock to their parents is equally important between the parents, while the positive reaction to a mental health diagnosis stems from mothers. Agreeableness is one of two cases where in boys, pooling parents masks two significant effects: Firstly, losing their mother significantly *increases* Agreeableness by .13 of a standard deviation (one of the largest point estimates)—while losing a father reduces it insignificantly. This *positive* effect of a severe shock on Agreeableness for boys could not be seen in Table 2. Similarly, Academic Self-Concept of boys is reduced following the mental health diagnosis of their *father*, but not their mother (which has a positive point estimate even, combining to a near-zero pooled effect in Table 2).

Girls' Conscientiousness seems to suffer more from Any Health Shock arising to their fathers than their mothers—similarly to boys, although the magnitude of the effects are larger (.04 and .09 reduction from Any and Cancer shock, vs .03 in boys). Indeed, their Conscientiousness is only decreased from their *fathers* having cancer, not their mothers (a statistically significant

[9]Since these regressions include a direct interaction tests of the effect of the shock by parental gender (every column called "Diff."), we drop the few children who experience a shock from both the mother and father. The share of excluded children ranges from 0.34% (cancer) to 1.16% (any health shock).

difference). We can also observe that the positive effect of a mental health diagnosis for Agreeableness, which was observed in Table 2, stems mostly from the effect of a *paternal* diagnosis on girls, and possibly from a maternal diagnosis on boys. In girls, the difference between the parents is significant. The point estimates even have opposing signs. Girls' Academic Self-Concept is unaffected by shocks to either the mother or the father.

Table 3 and Table 4 do not test directly whether boys are more vulnerable in terms of socio-emotional skills than girls. We include an interaction term explicitly in Table S.2. Overall, there are very few significant interaction terms for all of the health shocks, suggesting no greater vulnerability to boys of parental health shocks. Out of 32 tests, 3 are statistically significant: boys decrease more in Agreeableness from Any Health Shock or a Mental Health diagnosis to the father, but increase more than girls in Agreeableness from a Mental Health diagnosis to the mother. Bereavement from the father does not have a significant interaction term either, although all point estimates are negative, which would point to a greater susceptibility to this type of loss for boys. Yet bereavement from the mother has a significantly positive interaction terms for boys in terms of Agreeableness.

Table 3: The Short Run Effect of Parental Shocks by Parental Gender. Effect on Boys. Child Fixed Effects Estimates

	Conscientiousness			Agreeableness			Emot.Stability			Acad.Self-Concept			# Shocks	
	(1) Father	(2) Mother	(3) Diff.	(4) Father	(5) Mother	(6) Diff.	(7) Father	(8) Mother	(9) Diff.	(10) Father	(11) Mother	(12) Diff.	(13) Father	(14) Mother
Death	−0.081*	0.029	−0.111	−0.081	0.131*	−0.212***	0.018	−0.036	0.054	−0.064	0.062	−0.126	416	220
	(−1.86)	(0.41)	(−0.59)	(−1.62)	(1.82)	(−13.45)	(0.37)	(−0.51)	(0.10)	(−1.41)	(0.93)	(−1.07)		
Any Health Shock	−0.029	−0.012	−0.017	−0.029	−0.005	−0.024	−0.026	0.010	−0.035	−0.022	0.024	−0.046	2,451	2,399
	(−1.56)	(−0.64)	(−0.03)	(−1.44)	(−0.27)	(−0.06)	(−1.33)	(0.51)	(−0.18)	(−1.12)	(1.25)	(−0.48)		
Cardiovascular	−0.027	−0.017	−0.010	−0.042	−0.048	0.006	−0.021	0.041	−0.062	−0.002	−0.042	0.040	1,098	488
	(−0.98)	(−0.41)	(−0.01)	(−1.34)	(−1.11)	(0.01)	(−0.73)	(0.97)	(−0.28)	(−0.08)	(−1.06)	(0.09)		
Cancer	−0.033	−0.025	−0.008	−0.005	−0.023	0.018	−0.010	0.001	−0.012	0.014	0.035	−0.022	856	1,177
	(−1.13)	(−1.02)	(−0.01)	(−0.14)	(−0.90)	(0.03)	(−0.33)	(0.04)	(−0.02)	(0.45)	(1.34)	(−0.04)		
Mental Health	−0.027	0.010	−0.037	0.007	0.053	−0.047	−0.059	0.013	−0.072	−0.084*	0.052	−0.137***	532	768
	(−0.62)	(0.31)	(−0.07)	(0.15)	(1.46)	(−0.11)	(−1.32)	(0.37)	(−0.35)	(−1.96)	(1.41)	(−8.45)		

Note: This table reports the results for the sub-sample of boysonly, distinguishing the parental shocks by whether they are experienced by the father or the mother. Each cell from columns "Father" and "Mother" reports the β coefficient from Eq. (1) that identifies the causal effect of experiencing a given parental shock on the children's socio-emotional skills, which are standardized by child's, grade and calendar year to have mean zero and standard deviation 1. Columns "Diff." report the coefficient on the interaction term between the indicator for the respective shock and the gender of the shocked parent, estimated over the sample of boys, who experience a parental shock to either the mother or the father. Standard errors in parentheses clustered at the child level. $^{*}(p < 0.10),^{**}(p < 0.05),^{***}(p < 0.01)$.

Table 4: The Short Run Effect of Parental Shocks by Parental Gender. Effect on Girls. Child Fixed Effects Estimates

	Conscientiousness			Agreeableness			Emot.Stability			Acad.Self-Concept			# Shocks	
	(1) Father	(2) Mother	(3) Diff.	(4) Father	(5) Mother	(6) Diff.	(7) Father	(8) Mother	(9) Diff.	(10) Father	(11) Mother	(12) Diff.	(13) Father	(14) Mother
Death	−0.071	−0.039	−0.032	0.014	−0.096	0.110	0.027	0.016	0.011	−0.015	−0.083	0.068	392	221
	(−1.65)	(−0.59)	(−0.05)	(0.29)	(−1.32)	(0.53)	(0.57)	(0.26)	(0.01)	(−0.31)	(−1.26)	(0.17)		
Any Health Shock	−0.039**	−0.003	−0.036	0.029	−0.004	0.032	0.009	−0.027	0.036	−0.011	−0.010	−0.001	2,377	2,337
	(−2.13)	(−0.16)	(−0.21)	(1.41)	(−0.19)	(0.12)	(0.45)	(−1.41)	(0.19)	(−0.57)	(−0.53)	(−0.00)		
Cardiovascular	0.010	−0.030	0.040	−0.022	−0.011	−0.011	0.027	0.042	−0.015	−0.020	−0.022	0.002	1,021	444
	(0.34)	(−0.71)	(0.09)	(−0.70)	(−0.23)	(−0.01)	(0.87)	(0.90)	(−0.02)	(−0.68)	(−0.51)	(0.00)		
Cancer	−0.085***	0.017	−0.102***	0.038	0.028	0.010	0.016	−0.038	0.054	0.006	0.001	0.004	800	1,225
	(−2.85)	(0.69)	(−11.89)	(1.10)	(0.99)	(0.01)	(0.55)	(−1.48)	(0.32)	(0.17)	(0.04)	(0.00)		
Mental Health	−0.049	−0.013	−0.036	0.114***	−0.049	0.163***	−0.004	−0.030	0.026	−0.011	−0.018	0.007	603	724
	(−1.31)	(−0.39)	(−0.07)	(2.82)	(−1.33)	(55.64)	(−0.09)	(−0.85)	(0.04)	(−0.28)	(−0.48)	(0.01)		

Note: This table reports the results for the sub-sample of girlsonly, distinguishing the parental shocks by whether they are experienced by the father or the mother. Each cell from columns "Father" and "Mother" reports the β coefficient from Eq. (1) that identifies the causal effect of experiencing a given parental shock on the children's socio-emotional skills, which are standardized by child's, grade and calendar year to have mean zero and standard deviation 1. Columns "Diff." report the coefficient on the interaction term between the indicator for the respective shock and the gender of the shocked parent, estimated over the sample of girls, who experience a parental shock to either the mother or the father. Standard errors in parentheses clustered at the child level. $^{*}(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$.

4.1.3 Heterogeneity by SES

Parental health shocks are expected to affect their children's socio-emotional skills at least partially because the shocks are thought to reduce parental resources, thereby leading parents to reduce their subsequent investments in children. Many of the mechanisms we discussed earlier for how parental shocks translate to child skills involve parental resources. Therefore, children of low-resource parents could be disproportionally affected by such shocks. It is important to emphasize that low-resource parents could be more *likely* ex ante to *experience* a shock, but that we are interested in the causal effect of a shock on child skills conditional on belonging to an at-risk group.

At-risk groups in terms of resources could be cash-strapped parents, or parents who have a tighter time constraint than others. Therefore, we analyze whether the shocks have greater effects on the children of low-income parents, or of single mothers.

As described earlier, we define low-income families on the basis of the household's disposable per-capita income, which takes household income and the size of the family (number of children and adults) into account. We take this measure for the mother as a marker for the child's relevant financial resources, even if the child is not living at the mother's household. Table 5 contrasts mothers in the bottom quartile of disposable income in 2014 to the other three quartiles. Unlike our previous results, the income split shows differential effects of *health shocks* vs *bereavement*. Losing a father or mother has no detrimental effect on any socio-emotional skill of children in the bottom income quartile; yet it significantly decreases Conscientiousness of children whose mother's income was in the top 3 quartiles. *Health shocks*, on the other hand, display some negative effects for the poorest children, in terms of Conscientiousness, Agreeableness, and Academic Self-Concept. The magnitudes are reductions of .03-.04, larger than we had seen for the full sample, but in the same ballpark. For non-disadvantaged children (income quartiles 2-4), parental health shocks aggregated reduce Conscientiousness, as we have found before (but by less than their disadvantaged peers). The *increased* Agreeableness in the wake of a parental *mental* health diagnosis that was already detected in Table 2 stems exclusively from these non-disadvantaged children.

Single mothers are defined in our analysis as mothers who, in 2014, do not live with the biological father of the child in question. These mothers may, therefore, not be actually living alone with their child (but with a new partner)—but "broken families" are traditionally associated with worse outcomes; either because of the aforementioned time constraints of truly single parents, or the challenges of bringing in new parent-figures and co-parenting with a physically distant biological father. In that sense, our definition would designate children who may have more disadvantages than children who consistently lived with their biological mother and father.

As Table 6 shows, for these children of single mothers, losing one of the two parents[10] has *less detrimental* effects than for children living with both parents. Note that there are no statistically significant effects of bereavement for children of single mothers. This could reflect that these children are less close to their biological father, and therefore see their investments less reduced than children who interact closely with their father.

Health shocks have mixed effects on children of single mothers; it would be a stretch to conclude that the children from separated families or from single mothers experience greater detrimental effects than the children from stable homes. The results on Conscientiousness look very similar between the two groups. Cardiovascular shocks reduce Agreeableness of children living with both parents, Academic Self-Concept of children to single mothers, and *increase* Emotional Stability of children of single mothers. A Mental Health diagnosis increases Agreeableness of the disadvantaged group here—in contrast to the result from Table 5, where the increase happened in the top three income quartiles.

We conclude that health shocks do not consistently affect children of single mothers vs children living with both parents differentially. Yet health shocks that happen to *low-income* parents have stronger effects on their children than when they happen to non-disadvantaged parents. Bereavement tends to affect the more advantaged group more. One interpretation of this finding could relate to the importance of parental quality in skill formation. Losing a parent who was very efficient at investing in their children's skills would have a greater effect than losing an absent parent or one whose quality of time or investment was lower (to the extent that disposable income and quality of parental investments can be associated).

[10] Recall that the definition of single mother is based on current residence with both biological parents, thus a child to a single mother is not necessarily one with literally only one parent; their father is most likely alive, but living apart.

Table 5: The Short Run Effect of Parental Shocks by Disposable Income Quartiles. Child Fixed Effects Estimates

	Conscientiousness		Agreeableness		Emot.Stability		Acad.Self-Concept		# Shocks	
	(1) Top Q2-Q4	(2) Bottom Q1	(3) Top Q2-Q4	(4) Bottom Q1	(5) Top Q2-Q4	(6) Bottom Q1	(7) Top Q2-Q4	(8) Bottom Q1	(9) Top Q2-Q4	(10) Bottom Q1
Death	-0.084^{***}	0.015	-0.024	0.003	0.015	0.017	-0.047	0.014	784	456
	(0.031)	(0.048)	(0.035)	(0.051)	(0.033)	(0.050)	(0.032)	(0.049)		
p-value of difference		0.0843		0.665		0.976		0.303		
Any Health Shock	-0.018^{*}	-0.031^{*}	0.017	-0.040^{*}	-0.011	0.001	0.009	-0.034^{*}	6,881	2,813
	(0.011)	(0.018)	(0.012)	(0.020)	(0.011)	(0.019)	(0.011)	(0.019)		
p-value of difference		0.534		0.0159		0.591		0.0503		
Cardiovascular	-0.015	-0.015	-0.022	-0.054	0.001	0.038	-0.013	-0.025	2,082	956
	(0.020)	(0.031)	(0.021)	(0.035)	(0.021)	(0.032)	(0.021)	(0.032)		
p-value of difference		0.999		0.440		0.331		0.751		
Cancer	-0.021	-0.050	0.024	-0.043	-0.006	-0.023	0.024	-0.024	3,244	813
	(0.015)	(0.032)	(0.016)	(0.037)	(0.015)	(0.035)	(0.015)	(0.034)		
p-value of difference		0.414		0.0963		0.650		0.200		
Mental Health	-0.011	-0.020	0.059^{**}	-0.009	-0.019	-0.006	0.019	-0.049	1,585	1,034
	(0.023)	(0.031)	(0.025)	(0.033)	(0.023)	(0.033)	(0.024)	(0.034)		
p-value of difference		0.828		0.101		0.744		0.0983		

Note: Each cell reports the β coefficient from Eq. (1) that identifies the causal effect of experiencing a given parental shock on the children's socio-emotional skills, in the respective sub-sample by quartile of disposable income of the mother. The child skills are standardized by child's sex, grade and calendar year, to have mean zero and standard deviation 1. Standard errors in parentheses clustered at the child level. $^{*}(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$.

Table 6: The Short Run Effect of Parental Shocks by Single Mother Status. Child Fixed Effects Estimates

	Conscientiousness		Agreeableness		Emot.Stability		Acad.Self-Concept		# Shocks	
	(1) Both Par.	(2) Single Moth.	(3) Both Par.	(4) Single Moth.	(5) Both Par.	(6) Single Moth.	(7) Both Par.	(8) Single Moth.	(9) Both Par.	(10) Single Moth.
Death	-0.111^{***}	0.019	-0.031	0.005	-0.027	0.059	-0.061^{*}	0.008	648	607
	(0.036)	(0.038)	(0.040)	(0.042)	(0.036)	(0.041)	(0.036)	(0.040)		
p-value of difference		0.311		0.323		0.840		0.880		
Any Health Shock	-0.022^{**}	-0.020	-0.005	0.008	-0.017	0.008	0.002	-0.015	6,204	3,583
	(0.011)	(0.016)	(0.012)	(0.018)	(0.012)	(0.017)	(0.012)	(0.017)		
p-value of difference		0.292		0.330		0.914		0.783		
Cardiovascular	-0.021	-0.006	-0.047^{**}	-0.006	-0.016	0.073^{**}	-0.002	-0.055^{*}	2,014	1,065
	(0.020)	(0.030)	(0.022)	(0.034)	(0.021)	(0.031)	(0.021)	(0.031)		
p-value of difference		0.296		0.311		0.772		0.642		
Cancer	-0.024	-0.029	0.012	0.001	-0.012	-0.009	0.017	0.007	2,877	1,205
	(0.015)	(0.026)	(0.017)	(0.029)	(0.016)	(0.028)	(0.016)	(0.027)		
p-value of difference		0.292		0.314		0.956		0.839		
Mental Health	-0.019	-0.010	0.017	0.050^{*}	-0.019	-0.006	-0.025	0.011	1,351	1,295
	(0.026)	(0.026)	(0.027)	(0.029)	(0.026)	(0.028)	(0.026)	(0.029)		
p-value of difference		0.295		0.361		0.963		0.890		

Note: Each cell reports the β coefficient from Eq. (1) that identifies the causal effect of experiencing a given parental shock on the children's socio-emotional skills, in the respective sub-sample by whether or not the mother lives with the biological father of the child ("Both Par.") or alone/with a new partner ("Single Moth."). The child skills are standardized by child's sex, grade and calendar year, to have mean zero and standard deviation 1. Standard errors in parentheses clustered at the child level. $^{*}(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$.

4.1.4 Event Studies

Child fixed effects are a credible identification strategy, but they do not give insight into the dynamics of how the effects of shocks play out in the child's skills over time. Fixed effects could also hide potentially interesting anticipation effects. This is particularly salient in our context, where some diagnoses, such as mental health diagnoses, are likely to occur after the family has already experienced the effects of symptoms.

Event study regressions can provide insight into such dynamics. Due to the sharp occurrence of the shocks, as defined by the date of diagnosis, we can estimate the following event study regressions:

$$Y_{it} = \alpha + \sum_{t \neq -1} \beta_t \cdot t + \varepsilon_{it} \tag{2}$$

where Y_{it} is child i's standardized trait at time relative to shock t (with $t = 0$ already affected). Since we observe up to 4 waves of the well-being surveys for each child, we can identify parameters up to three years after the shock (periods 0, 1 and 2) for children who experienced the shock right after they took the first survey in 2015, and up to 2 years before the shock (periods -1 and -2). Note that we do not include individual fixed effects in this event-study model, since a potential linear trend would not be identified (as pointed out by Borusyak and Jaravel, 2017). We perform this event study on the same sample of children as the OLS estimates presented above.

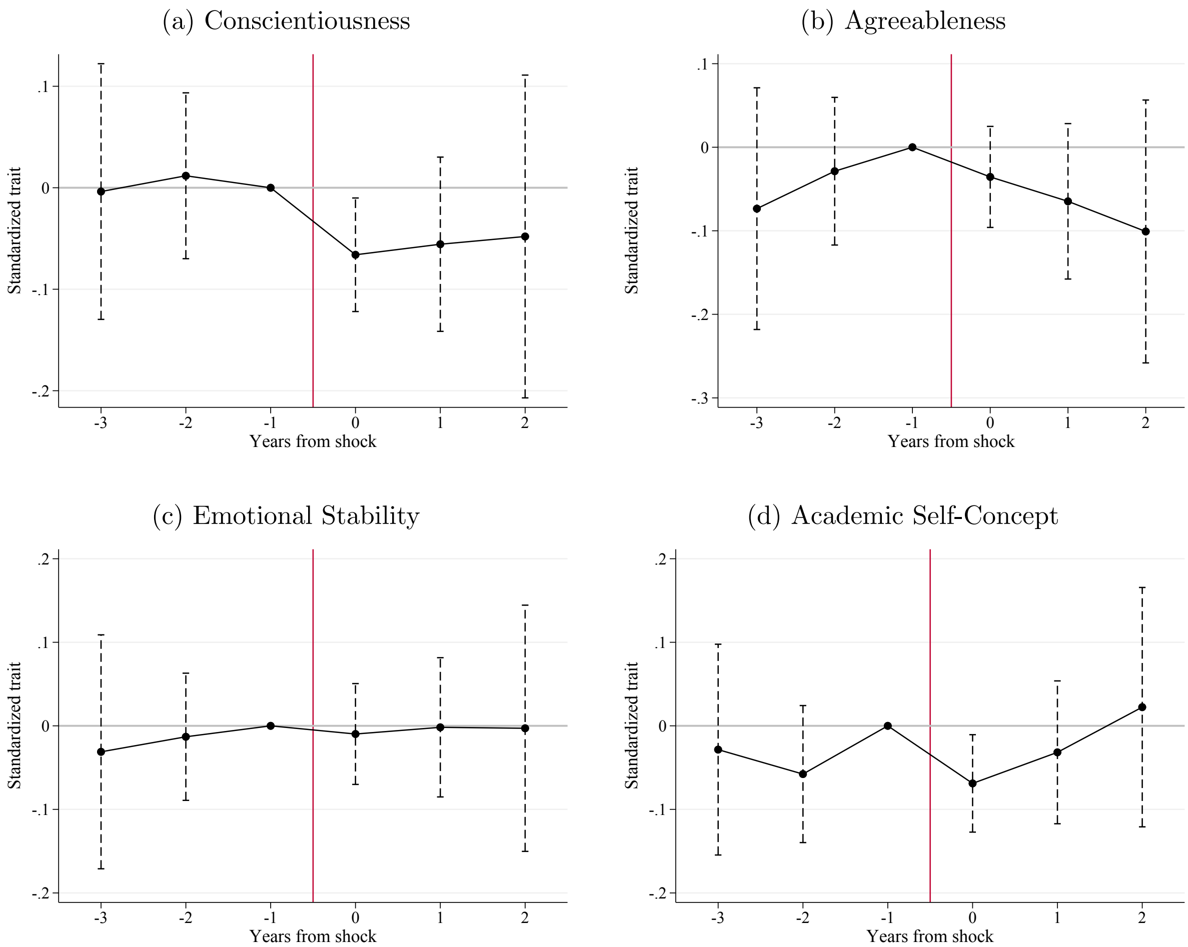
Figure 1 plots the β_t coefficients estimated from Eq. (2) that show the dynamics of the different socio-emotional skills around the *death* of a parent, and Fig. 2 around the combined parental health shocks.[11] Clearly, despite the possibility of important *anticipation* effects, there are no statistically significant dynamics. Consider the case of Conscientiousness, where we had identified significant negative effects from a parental death or the aggregate health shocks (Table 2): in the periods leading up to the shock (periods -2 and -1), children have no statistically significant differences in Conscientiousness, if anything the time trend before the health shock looks like it *increases* leading up to the shock. Thus, nothing suggests that children's Conscientiousness picks up pre-diagnosis effects of the parental health shock.

As for dynamics after the shock, coefficients tend to be more negative, particularly in period

[11] See Appendix Figs. S.1 to S.4 for results disaggregated by type of health shock and child's gender.

0, immediately after the shock. For the case of Conscientiousness, the coefficient for $t = 0$ is negative and statistically significant while coefficients in periods 1 and 2 remain negative but not significantly different from zero. Despite the increased noise in these event study estimations, particularly in periods further away from period -1 where the number of observations decreases, the dynamics of the traits are consistent with the estimations from the pooled child-fixed effects strategy presented in Table 2.

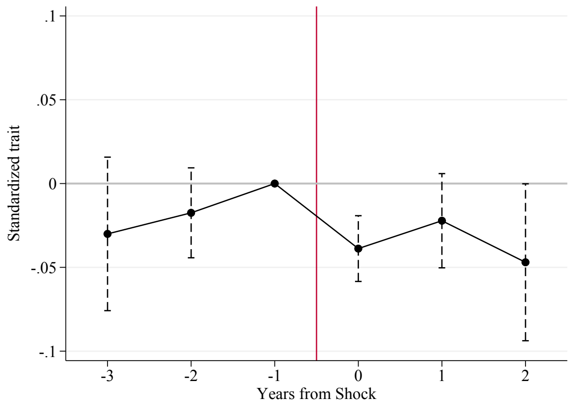
Figure 1: Event Study: Death



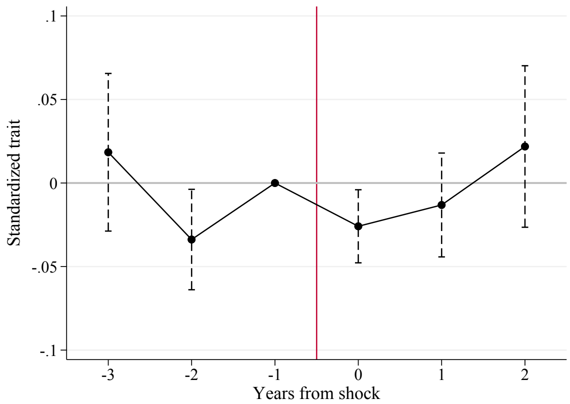
Note: These figures show the β_t coefficients estimated from Eq. (2) describing the dynamics of each socio-emotional skill around the time of Death, which is indicated with the vertical red line between -1 and 0. See Appendix Figs. S.1 to S.4 for the results from dissagregating the health shocks, and from a split by child's gender. The confidence intervals of each coefficient at the 95% level are calculated from standard errors clustered at the individual level.

Figure 2: Event Study: Any Health Shock

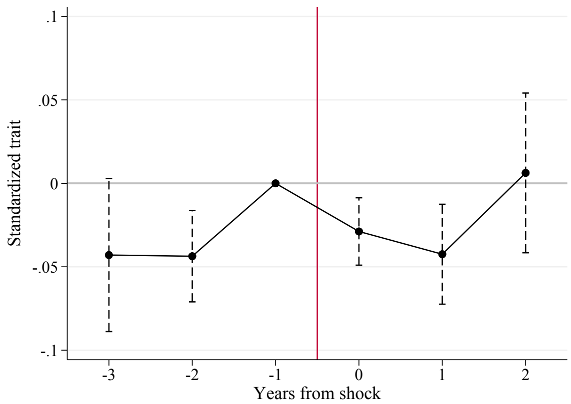
(a) Conscientiousness



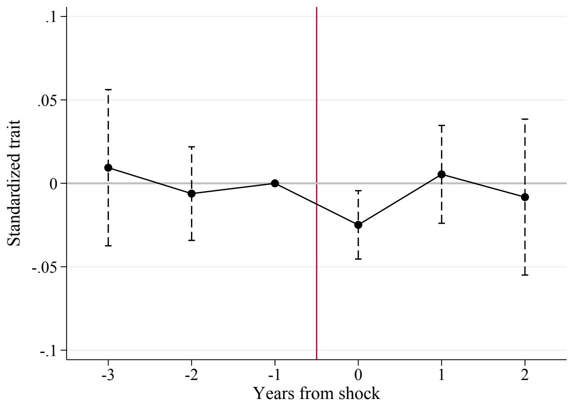
(b) Agreeableness



(c) Emotional Stability



(d) Academic Self-Concept



Note: These figures show the β_t coefficients estimated from Eq. (2) describing the dynamics of each socio-emotional skill around the time of Any Health Shock, which is indicated with the vertical red line between -1 and 0. See Appendix Figs. S.1 to S.4 for the results from dissagregating the health shocks, and from a split by child's gender. The confidence intervals of each coefficient at the 95% level are calculated from standard errors clustered at the individual level.

4.2 Evidence on Long Run Effects

The previous sections have painted a picture of relative robustness of children's socio-emotional skills, with small negative effects of parental health shocks on Conscientiousness.

Yet as discussed earlier, one could surmise that the effects of parental shocks do not materialize immediately, but accumulate over time into long-run effects. Under this hypothesis, children who have experienced a shock a longer time ago would have less advantageous socio-emotional skills later in life.

Both the pooled child-fixed effects and the event study design are limited to the study of shocks that occurred during the 4 years during which we observe the socio-emotional skills in the DWS, at ages 10 to 16. While the event study lets us explore dynamics to some extent, the latest we observe child outcomes is three years after the parental health shock. To explore the long-run effects of parental shocks that affect children from earlier ages, we employ an empirical strategy that identifies these effects comparing siblings. This strategy has also been employed by Laird et al. (2020) on Danish data to study the effect of divorce on educational attainment, and by Chen et al. (2009) to study the effect of a parental death on educational attainment in Taiwan. Specifically, we estimate the following model over a sample of sibling pairs who experienced the same parental health shock at different ages from 0 to 14:

$$Y_{ipa} = \alpha + \sum_{s=1}^{13} \beta_s \cdot I(AgeShock_i = s) + \phi_p + \gamma X_i + \epsilon_{ipa} \qquad (3)$$

where Y_{ipa} is the standardized trait of child i, born to parent p, measured at age a (in our case, 15 years); $AgeShock_i$ is an indicator for child i experiencing a shock at age s; ϕ_p is a parent fixed effect; and X_i is a vector of controls, including birth order, cohort and gender of the child. The β_s parameters identify the causal effect of experiencing a parental shock at a given age with respect to experiencing it at a baseline age (here, age 14). With this strategy we consider all shocks a child can experience from age 0 to age 14. We are, however, limited to analyzing sibling pairs who have lived through the same parental shock and who have both completed the DWS at age 15. Therefore, with four waves of the survey, the sample of siblings considered can be born at most four years apart, and the gap in a given shock occurring between the two can also be at most four years.[12]

[12]This leads to larger confidence intervals of the coefficients for shocks experienced at ages further from the baseline age of 14, as they are the compounded effect from smaller gaps in the shocks experienced by the siblings.

Figure 3 implements this parent fixed effects strategy for the measure of Any Health Shock. We plot the estimated effect of experiencing a shock at a given age relative to experiencing it at age 14, by comparing siblings of different ages. The overall impression of the long-run effects of shocks on the four traits is that earlier shocks are worse than later shocks, while most of the individual point estimates for specific ages at the shock are insignificant. Note that the large standard errors are due to the small size of the sample and the estimation with parent fixed effects.

Since these flexible age-by-age estimates of Eq. (3) look rather linear, we also estimate the following linear specification to gauge the magnitude of the effect

$$Y_{ipa} = \alpha + \beta \cdot AgeShock_i + \phi_p + \gamma X_i + \epsilon_{ipa} \tag{4}$$

This specification only differs from Eq. (3) in that the age at which each child i experiences the shock enters linearly, with the linear effect given by the parameter β.

Table 7: The Long Run Effect of Parental Shock. Linear Estimates from Parent Fixed Effects

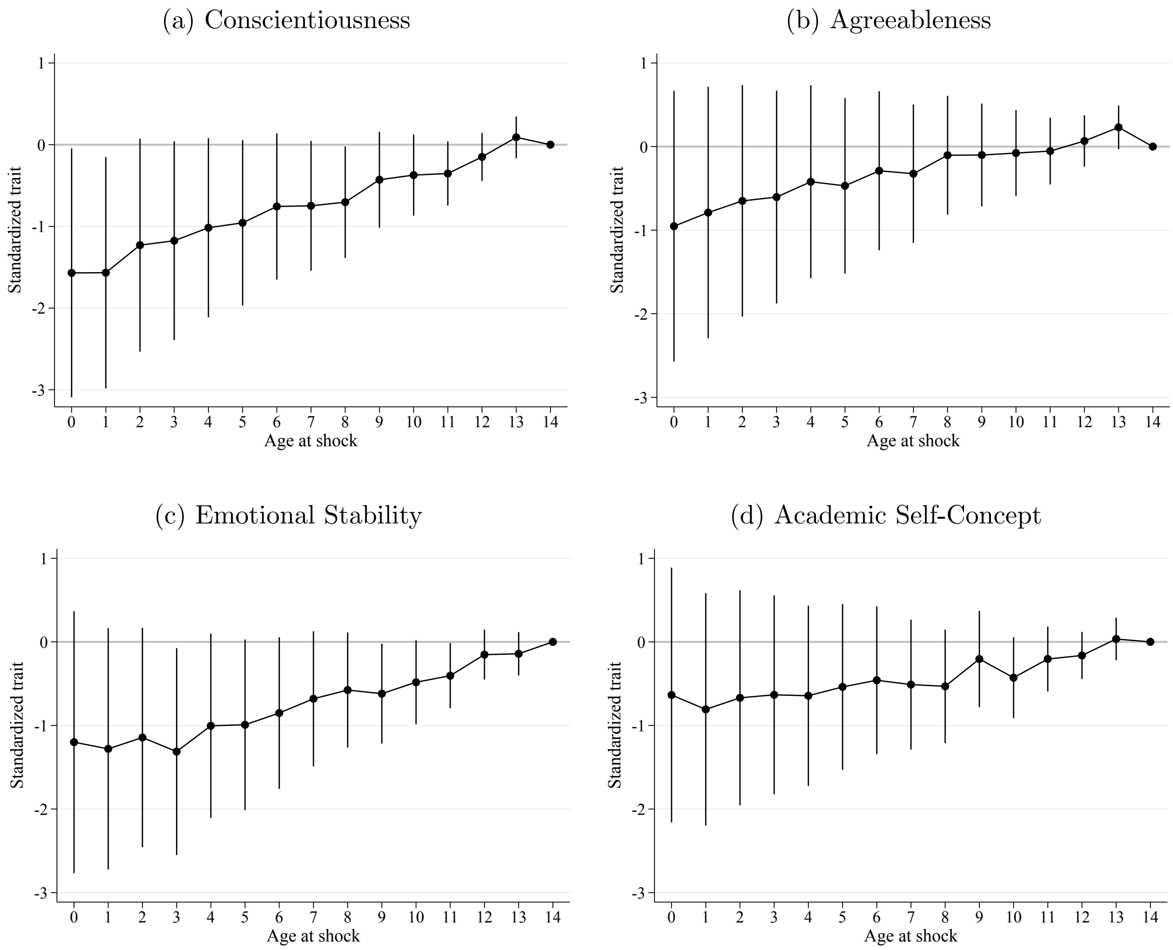
	(1) Conscientiousness	(2) Agreeableness	(3) Emot.Stability	(4) Acad.Self-Concept
Age at shock	0.126**	0.0726	0.0953*	0.0707
	(0.054)	(0.058)	(0.055)	(0.053)
Observations	3,778	3,778	3,778	3,778

Note: This table reports the β coefficient estimated for Eq. (4) for each socio-emotional skill, which is standardized by child's sex, grade, and calendar year to have mean zero and standard deviation 1, and is measured at age 15. The coefficients identify the linear effect of experiencing a parental health shock one year later, closer to the baseline age of 14. Robust standard errors clustered at the parental level are reported in parentheses. $^*(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$

Table 7 shows results consistent with the more flexible estimation presented in Fig. 3: that experiencing a shock earlier, rather than later, has significantly more harmful effects on Conscientiousness and Emotional Stability by age 15. Experiencing a parental health shock one year later increases Conscientiousness by 0.126 of a standard deviation and Emotional Stability by 0.095. These results would be in line with an accumulation of disadvantage, which could stem from the dynamic complementarity in skill formation over the life cycle, or scarring and socialization (as discussed in Section 2).

Perhaps surprisingly, the long-run effect of experiencing a shock one year later is larger than the

Figure 3: The Long Run Effect of Experiencing a Parental Shock at Different Ages



Note: These graphs report the β_s coefficients from Eq. (3), where each coefficient identifies the causal effect of experiencing a parental health shock at a given age relative to experiencing the same shock at age 14. Identification comes from comparing siblings who both experienced the same shock but at different ages. We report confidence intervals at the 95% level from clustered standard errors at the parental level.

short-run effect of experiencing the shock as estimated in Table 2. Note however that the two estimates are not directly comparable: the short-run results in Table 2 use a child's pre-shock socio-emotional scores as a counterfactual to identify the effect of the shock immediately after, while the long-run effects from Table 7 use the sibling's score measured at the same ages (15) as a counterfactual to identify the effect of having experienced a shock at different ages. Also, the short-run sample considers shocks that can occur in between ages 10-15 while the long-run shocks considers shocks between ages 0-14. The large standard errors of the long-run estimates also make us interpret these results with caution.

One explanation under which both results would be reconciled, if we engaged in the thought experiment of considering them strictly comparable, is the case where there is no effect on socio-emotional skills in the period immediately after the shock, but one emerges some time after. This could be seen as an "incubation" period. Under this hypothesis, our short-run strategy would not capture the effects from the post-incubation period, while the long-run strategy, which evaluates the traits at a later age of 15, would. If this is the case, the long-run strategy should not find an effect for shocks experienced right before the socio-emotional skills are measured, and we indeed see a flat or less pronounced slope for shocks between ages 12 and 14.

With these caveats, we see the long-run results as complementary of the main analysis. It is very difficult to obtain very early pre-shock measures of socio-emotional skills for a large sample of children, and then have long-run follow-up data. Therefore, even though we interpret the results with caution, they provide important suggestive evidence for the importance of the timing of early shocks — this calls for further research in this area to further explore long-run dynamics of children's personality formation and to speak directly to the literature on life cycle skill formation.

5 Testing Non-Response in the DWS as a Function of Shocks

An important challenge for our analysis is the potential of selective non-response from the sample of children who experience a parental shock. We define two types of non-response. First, non-participation: children who experience a parental shock might be less likely to participate in the survey (e.g. not attending school when the survey was distributed). Second, partial-response: children who participate in the DWS after experiencing a parental shock might be less likely to answer the specific questions that we use to construct their measured socio-emotional skills.

This challenge is common to most other studies, but our access to register data for the entire population of children in Denmark gives us the unique opportunity to quantify the degree of non-participation in the survey following the parental shocks. We also test the degree of partial-response among participants.

Non-participation in the DWS. We test whether children are less likely to participate in the DWS after they experience a parental shock compared to the years before the shock.

We use the full population of children in Denmark who were enrolled in schools that collected student responses to the survey in a given year, for a given age group.[13] We then focus on children who experienced a parental shock during the period in which the DWS was collected, and who participated in the DWS the year before the shock. This is a necessary restriction as we need to observe the date when the DWS was taken to assign the timing of the shock correctly. This is the same restriction we applied in our main analysis.

The resulting sample of analysis therefore contains only observations from children who attend a school where the survey was distributed, and who are observed at an age and year where they should have participated. By construction, all children in this sample took the survey a year before the parental shock occurred ($t = -1$). Therefore, we test whether the parental shock increases the likelihood of not participating in th DWS the years after ($t = \{0, 1, 2\}$) against the likelihood of not participating in the DWS the years before ($t = \{-2, -3\}$). Specifically, we estimate the following regression

$$Y_{it} = \alpha + \beta \cdot Post_{it} + \delta \cdot D_{-1} + \gamma X_i + \epsilon_{it} \tag{5}$$

[13]Note that we do not observe the class or grade of children who do not participate in the DWS, which is why we use age instead.

where Y_{it} is an indicator for not participating in the DWS, $Post_{it}$ is an indicator for time after the parental shock $t = \{0, 1, 2\}$ and D_{-1} is a dummy variable for the period just before the shock, that we exclude because by construction all children participate in the DWS in that period. X_i is a vector of controls composed by children's age interacted with gender.

We report the results of the non-participation test in column (1) of Table 8. We see that children who experience a parental shock have a slightly higher probability of not participating in the DWS the years after. The effects are small and only significant for mortality shocks (.032 of a standard deviation) and cancer shocks (.016 of a standard deviation).

The increased probability of non-participation in the DWS after a parental shock could bias our results if the non-participant children are a selected subsample, such as those affected the most by the parental shock. To be reassured that our results are robust to this possible bias, we replicate our analysis imputing the traits of the missing respondents with the least favorable and the most favorable outcomes from the observed distribution of children who participated in the DWS. This test is inspired by Lee (2009). The results of this exercise are reported in Appendix Table S.3. We observe that for the least favorable imputation, corresponding to the assumption that all non-participant children would have scored the worst outcomes (10^{th} percentile of the distribution) only a few coefficients are significantly different from zero, and all point estimates are below -0.075 of a standard deviation (in absolute terms), which are still fairly small effects.

Non-participation is very small in the DWS thanks to the way the DWS was distributed, reaching almost all children from the schools where it was distributed. However, note that non-participation is more likely to occur in smaller, voluntary surveys particularly if the respondents are the potentially shocked parents. Unfortunately, testing for selective non-participation in these cases is often unfeasible.

Partial response in the DWS. The second type of non-response would occur if children who experience a parental shock are less likely to answer the questions we use to construct the socio-emotional skills, and are therefore excluded from the analysis.

To test partial response we consider the full sample of children who participated in the DWS, and construct an indicator variable for when a child did not answer one or more of the questions used to construct the socio-emotional skills and therefore misses one or more trait. We then apply the same empirical strategy as for the short-run analysis, and estimate Eq. (1) for the partial-response dummy variable. The results are reported in column (3) of Table 8 and we find no evidence of a greater likelihood of missing traits (partial response) after experiencing a parental health shock. (For bereavement, the point estimate is 0.023 but it is not statistically significant from zero.)

Table 8: Non-Response as Function of Parental Shocks

	(1) Non-participation	(2) # Shocks	(3) Partial Response	(4) # Shocks
Death	0.032^{**}	1,598	-0.023	1,368
	(0.01)		(0.014)	
Any Health Shock	0.002	11,720	-0.006	10,515
	(0.00)		(0.005)	
Cardiovascular	-0.007	3,777	0.002	3,371
	(0.01)		(0.009)	
Cancer	0.016^{**}	4,773	-0.012	4,356
	(0.01)		(0.007)	
Mental Health	0.003	3,335	-0.006	2,922
	(0.01)		(0.01)	

Note: This table reports the results from two different tests of non-response for the different types of parental shocks. Each cell of column (1) reports the β coefficient from Eq. (5) estimated for each parental shock, capturing the increased likelihood of not participating in the DWS after experiencing a parental shock. Column (3) reports the β coefficients resulting from estimating Equation (1) for an outcome variable that takes one if a children did not answer one or more questions used to construct the socio-emotional traits. Columns (3) and (4) report the number of shocks that are considered in each estimation respectively. The number of shocks is larger in the test of non-participation because we also include shocked children who did not participate in the DWS. Robust standard errors clustered at the individual level. $^{*}(p < 0.10),^{**}(p < 0.05),^{***}(p < 0.01)$.

6 Discussion and Conclusion

We have presented causal evidence for the effects—or absence of effects—of parental health shocks on child socio-emotional skills. Our short run analyses (child fixed effects and event studies) suggest relative robustness of 11-16 year-old children's socio-emotional skills against even the severe parental health shocks considered. One trait, Conscientiousness, was consistently lowered in the wake of parental health events or bereavement, but the magnitude was small. Testing heterogeneity by SES, we did not find specific groups that were more or less at risk of seeing decreases in their socio-emotional skills following parental health shocks. Even in the complementary long-run analysis, two of the four skills tested are unaffected.

Was this to be expected? On the one hand, yes; considering the studies of Cobb-Clark and Schurer (2013) and Elkins et al. (2017). For adults, Cobb-Clark and Schurer (2013) convincingly showed that the personality trait of Locus of Control is invariant to life events including a range of types: family formation/dissolution, fertility, labor market shocks, retirement, and health shocks. Elkins et al. (2017) observe adolescents into adulthood for an eight-year span, and do not find any personality trait to respond systematically to the majority of common one-off family-, income-, and health-related shocks.

On the other hand, this was in no way to be expected for the sample of children in the age range 11-16 we have considered. Cobb-Clark and Schurer (2013) also show that personality changes are concentrated among the *young* (even if they are not related to the shocks tested). Childhood and early adolescence is the time in one's life during which personality traits are potentially the most malleable (see, for ex. Roberts and DelVecchio, 2000). The "plaster theory" contends that personality becomes fixed by the age of 30 only (McCrae and Costa Jr., 1996). Childhood is also the time during which parents still exert a considerable influence—thus leaving the door open for the largest spill-overs. We study the period in life during which one would expect the largest potential effects of parental shocks on socio-emotional skills. Furthermore, we consider more severe shocks than others in the literature who have found no effects once selection was taken care of (Le and Nguyen, 2017). Moreover, Kristiansen (2020) uses the same data as we do, and finds significant effects of parental health shocks on children's educational performance and attainment.

Note however, that comparing siblings who experience the same parental shock at different ages did provide suggestive evidence for significant long-run decreases in child's Conscientiousness and Emotional Stability. While we interpret these estimates with caution due to the large standard errors, we think they provide novel evidence on the formation of children's socio-emotional skills, potentially reflecting accumulation or incubation dynamics following early shocks. Providing this type of causal estimates demands large datasets over a long period of time, with information on both parents' health and children's socio-emotional skills, making our dataset ideally suited for the task. Still, we think further research is needed to better understand the long-run dynamics of parental shocks on children's personality.

We have tested whether parent health shapes child socio-emotional skills causally. We thereby contribute to the literature on life cycle skill formation, because child skills are shaped by parents' investments in terms of time and resources, and both of these are possibly affected by shocks to parents' health. A large literature documents how early childhood experiences drive long-run outcomes. Many of these experiences are intertwined and correlated with other parental characteristics. Therefore, it is important that we find that parental health shocks *in themselves* do not generate large differences in child skills, at least in the short-run.

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S Appendix

Table S.1: Association of Socio-Emotional Skills with Demographic Characteristics

	(1) Conscient.	(2) Agreeableness	(3) Emot.Stability	(4) Acad.Self-Concept
Female	-0.035^{***}	0.389^{***}	-0.292^{***}	-0.023^{***}
	(0.003)	(0.002)	(0.003)	(0.003)
Parents College	0.289^{***}	0.160^{***}	0.121^{***}	0.269^{***}
	(0.003)	(0.003)	(0.003)	(0.003)
Mother Income Lowest Quart.	-0.241^{***}	-0.151^{***}	-0.155^{***}	-0.216^{***}
	(0.003)	(0.003)	(0.003)	(0.003)
Single Mother	-0.246^{***}	-0.133^{***}	-0.172^{***}	-0.210^{***}
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	1026664	1026664	1026664	1026664

Note: This table shows the differences in socio-emotional skills by socio-demographic characteristics for the full DWS. Each cell reports the β coefficient from estimating the equation $Y_{it} = \alpha + \beta D_i + \epsilon_{it}$ where D_i is a variable that takes 1 if the child's gender is female, or their parents have college education, or their mothers' income is in the lowest quartile or if, sequentially, the mother is a single mother. Socio-emotional skills are standardized by child's gender, grade, and calendar year except for the estimation of the gender gap, where we do not standardize by gender. $^{*}(p < 0.10)$, $^{**}(p < 0.05)$, $^{***}(p < 0.01)$.

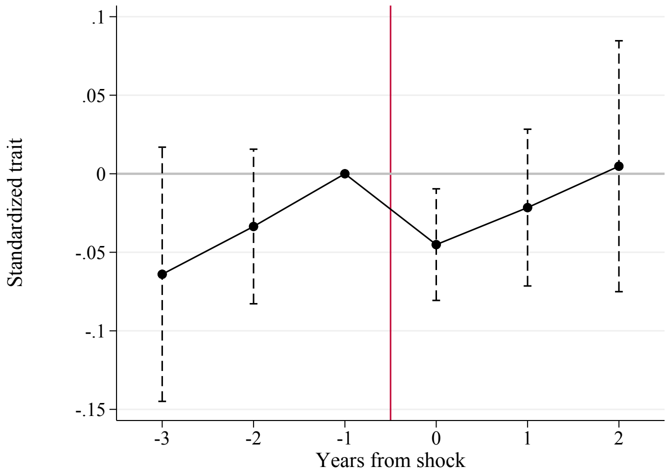
Table S.2: The Short Run Effect of Parental Shocks by Parent and Child Sex

	(1) Conscientiousness	(2) Agreeableness	(3) Emot.Stability	(4) Acad.Self-Concept
Death Father	-0.071^{*}	0.014	0.027	-0.015
	(0.04)	(0.05)	(0.05)	(0.05)
Death Father × Male	-0.010	-0.095	-0.009	-0.050
	(0.06)	(0.07)	(0.07)	(0.07)
Death Mother	-0.039	-0.096	0.016	-0.083
	(0.07)	(0.07)	(0.06)	(0.07)
Death Mother × Male	0.068	0.227^{**}	-0.052	0.145
	(0.10)	(0.10)	(0.09)	(0.09)
Health Shock Father	-0.039^{**}	0.029	0.009	-0.011
	(0.02)	(0.02)	(0.02)	(0.02)
Health Shock Father × Male	0.010	-0.058^{**}	-0.034	-0.011
	(0.03)	(0.03)	(0.03)	(0.03)
Health Shock Mother	-0.003	-0.004	-0.027	-0.010
	(0.02)	(0.02)	(0.02)	(0.02)
Health Shock Mother × Male	-0.009	-0.001	0.037	0.034
	(0.03)	(0.03)	(0.03)	(0.03)
Cardiovascular Father	0.010	-0.022	0.027	-0.020
	(0.03)	(0.03)	(0.03)	(0.03)
Cardiovascular Father × Male	-0.037	-0.020	-0.048	0.018
	(0.04)	(0.04)	(0.04)	(0.04)
Cardiovascular Mother	-0.030	-0.011	0.042	-0.022
	(0.04)	(0.05)	(0.05)	(0.04)
Cardiovascular Mother × Male	0.013	-0.037	-0.000	-0.020
	(0.06)	(0.06)	(0.06)	(0.06)
Cancer Father	-0.085^{***}	0.038	0.016	0.006
	(0.03)	(0.03)	(0.03)	(0.03)
Cancer Father × Male	0.052	-0.043	-0.027	0.008
	(0.04)	(0.05)	(0.04)	(0.04)
Cancer Mother	0.017	0.028	-0.038	0.001
	(0.02)	(0.03)	(0.03)	(0.03)
Cancer Mother × Male	-0.042	-0.051	0.039	0.034
	(0.04)	(0.04)	(0.04)	(0.04)
Mental Health Father	-0.049	0.114^{***}	-0.004	-0.011
	(0.04)	(0.04)	(0.04)	(0.04)
Mental Health Father × Male	0.022	-0.107^{*}	-0.055	-0.074
	(0.06)	(0.06)	(0.06)	(0.06)
Mental Health Mother	-0.013	-0.049	-0.030	-0.018
	(0.03)	(0.04)	(0.04)	(0.04)
Mental Health Mother × Male	0.024	0.102^{**}	0.043	0.070
	(0.05)	(0.05)	(0.05)	(0.05)

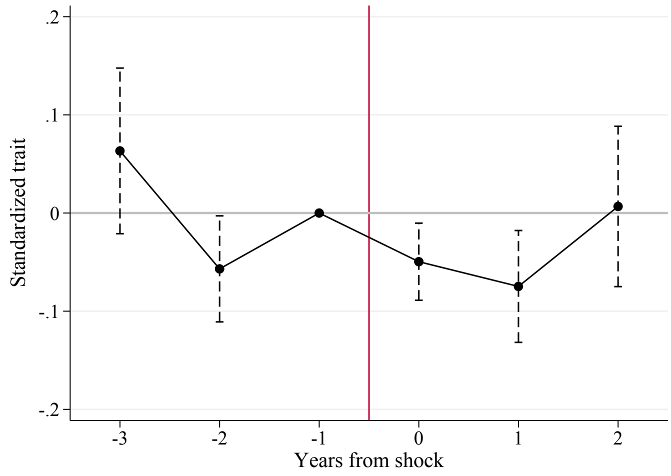
Note: This table presents the main results for the short-run effects estimated from Eq. (1) over the pooled sample of boys and girls but adding an interaction term if the child is male and experienced the a parental shock (such as "Death Father × Male." Parental shocks are also disaggregated by parental gender. This table therefore subsumes both Table 3 and Table 4 offering a statistical test for whether boys and girls are significantly affected differently by each type of parental shock. $^{*}(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$.

Figure S.1: Event Study: Cardiovascular Shock

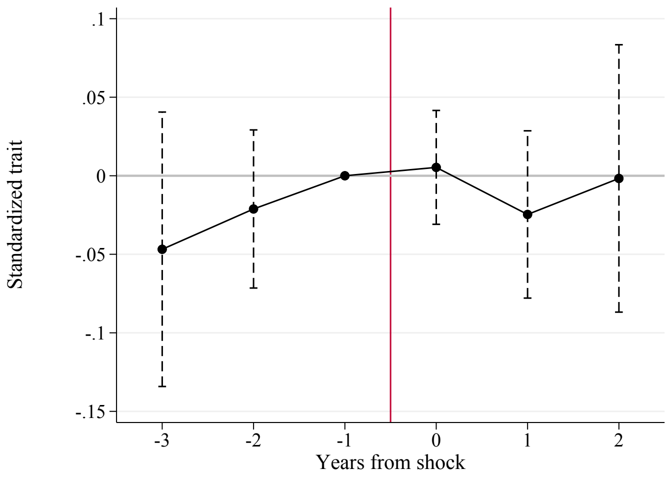
(a) Conscientiousness



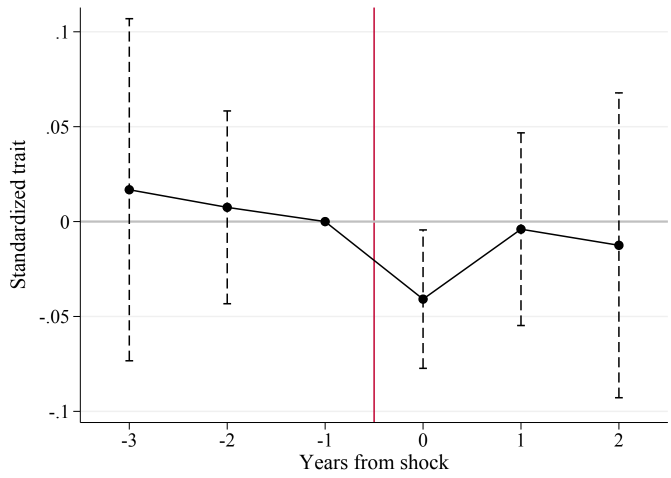
(b) Agreeableness



(c) Emotional Stability

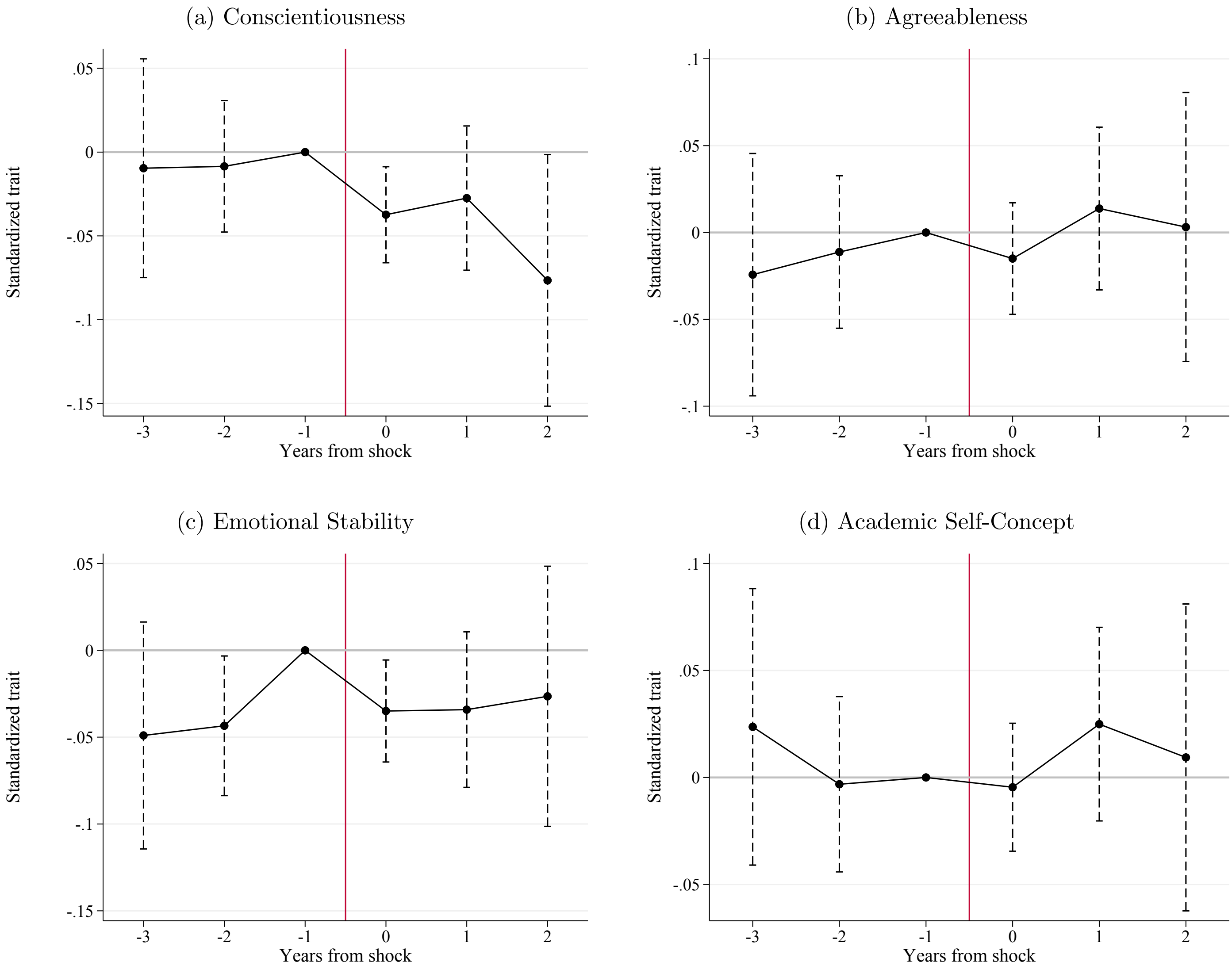


(d) Academic Self-Concept



Note: See notes to Fig. 1 for further notes.

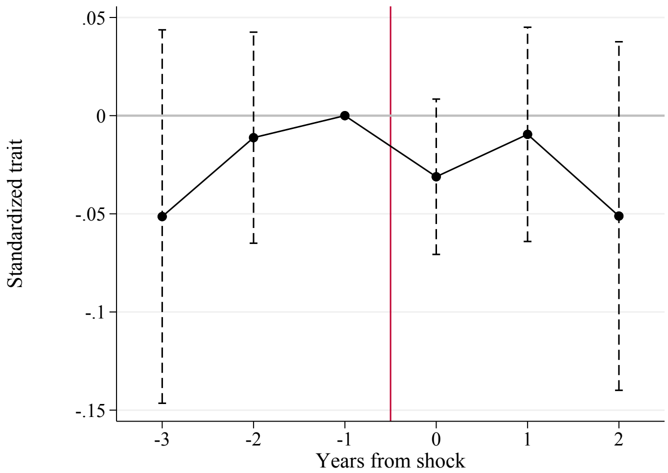
Figure S.2: Event Study: Cancer



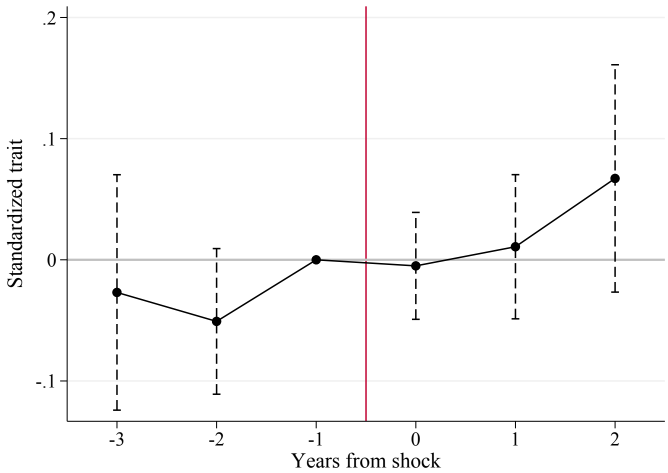
Note: See notes to Fig. 1 for further notes.

Figure S.3: Event Study: Mental Health Diagnosis

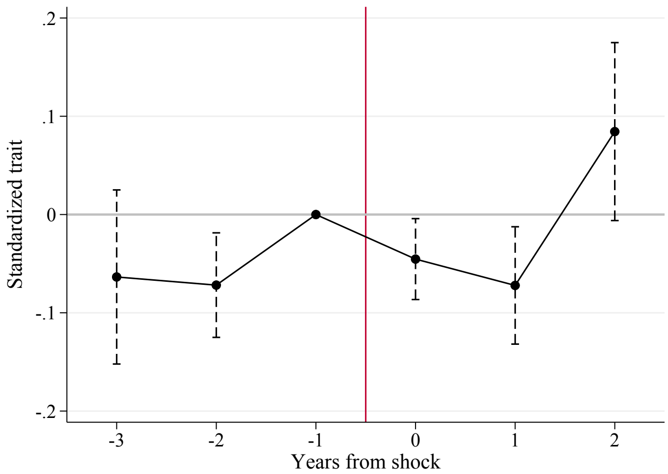
(a) Conscientiousness



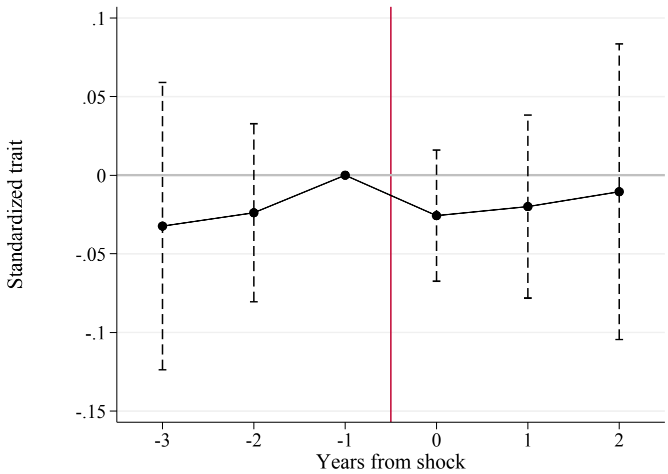
(b) Agreeableness



(c) Emotional Stability



(d) Academic Self-Concept

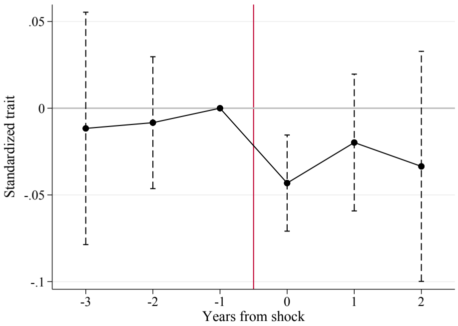


Note: See notes to Fig. 1 for further notes.

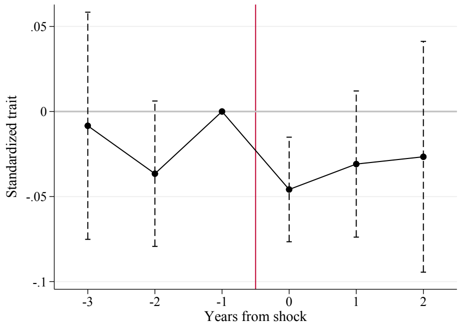
Figure S.4: Event Study: Any Health Shock, by Child Gender

A. Boys

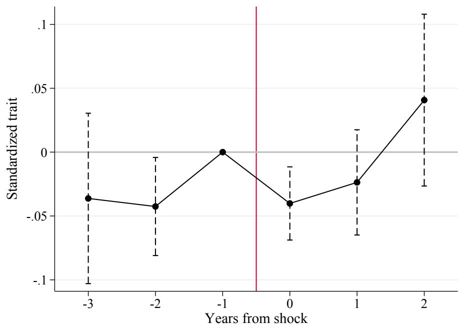
(a) Conscientiousness



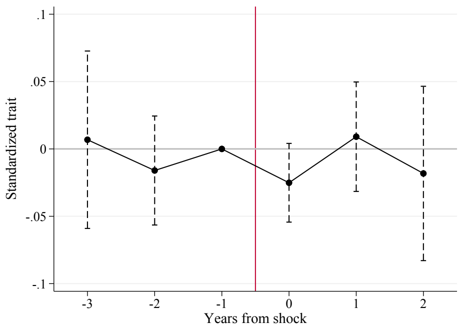
(b) Agreeableness



(c) Emotional Stability

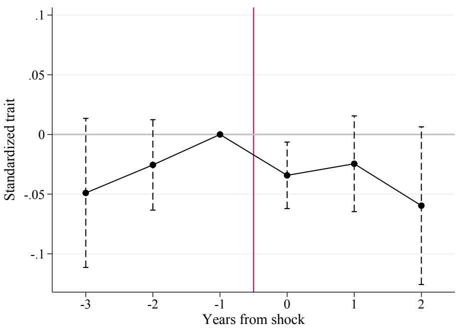


(d) Academic Self-Concept

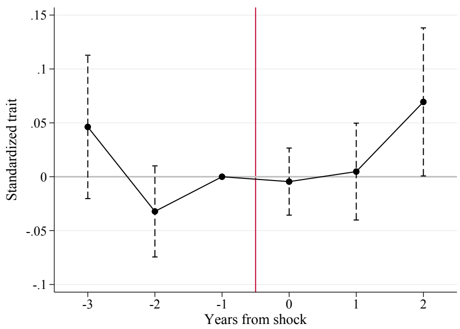


B. Girls

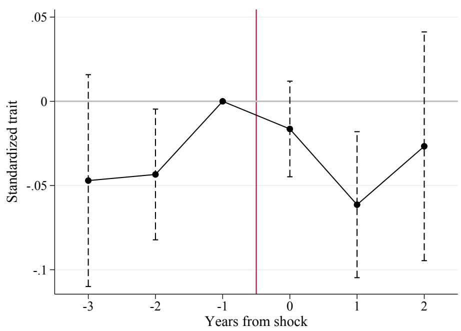
(e) Conscientiousness



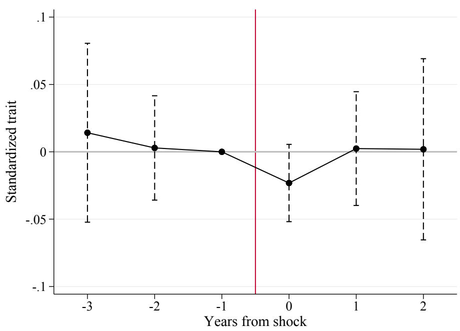
(f) Agreeableness



(g) Emotional Stability



(h) Academic Self-Concept



Note: See notes to Fig. 2 for further notes. Here replicating the strategy simply split by child sex.

Table S.3: Individual Fixed Effects, Short Run

	(1) Conscientiousness	(2) Agreeableness	(3) Emot. Stability	(4) A. Self-Concept	(5) # Shocks
A. Baseline					
Death	−0.054	0.026	0.022	0.002	1,436
	(0.04)	(0.05)	(0.04)	(0.04)	
Any Health Shock	−0.018	0.001	0.025*	−0.003	10,699
	(0.01)	(0.02)	(0.02)	(0.02)	
Cardiovascular	−0.008	−0.004	0.035	−0.035	3,436
	(0.03)	(0.03)	(0.03)	(0.03)	
Cancer	−0.026	−0.015	0.022	0.004	4,452
	(0.02)	(0.02)	(0.02)	(0.02)	
Mental Health	−0.010	0.054*	0.037	0.026	2,960
	(0.03)	(0.03)	(0.03)	(0.03)	
B. Lower bound					
Death	−0.073*	−0.043	−0.055	−0.037	1,531
	(0.04)	(0.04)	(0.04)	(0.04)	
Any Health Shock	−0.027*	−0.030**	−0.003	−0.020	11,221
	(0.01)	(0.02)	(0.02)	(0.01)	
Cardiovascular	−0.034	−0.057**	−0.030	−0.077***	3,610
	(0.03)	(0.03)	(0.03)	(0.03)	
Cancer	−0.029	−0.031	0.010	−0.006	4,620
	(0.02)	(0.02)	(0.02)	(0.02)	
Mental Health	−0.022	0.001	0.004	0.007	3,145
	(0.03)	(0.03)	(0.03)	(0.03)	
C. Upper bound					
Death	0.073*	0.110**	0.090**	0.123***	1,531
	(0.04)	(0.05)	(0.04)	(0.05)	
Any Health Shock	0.022	0.020	0.045***	0.033**	11,221
	(0.02)	(0.02)	(0.01)	(0.02)	
Cardiovascular	0.078***	0.060**	0.080***	0.045	3,610
	(0.03)	(0.03)	(0.03)	(0.03)	
Cancer	−0.000	−0.001	0.039*	0.026	4,620
	(0.02)	(0.02)	(0.02)	(0.02)	
Mental Health	0.014	0.039	0.040	0.047	3,145
	(0.03)	(0.03)	(0.03)	(0.03)	

Note: This table presents the result of the bounding exercise. Panel A presents the baseline estimates where children who do not participate in the DWS are not included. Note that this panel is equivalent to Table 2 except that we have excluded the observations from the year just before the parental shock, since by definition all children from this period participate in the DWS and including them in the estimation would bias the bounding exercise by adding one entire year of observations to the pre-shock period that will not be imputed. Instead, we follow the same strategy as we used to quantify the degree of non-participation and exclude the year before the shock. Panel B presents the estimates from a sample where for all children who did not participate in the DWS but who should have participated (based on the school they attend, their age and the calendar year), their traits have been imputed with the 10^{th} percentile of the observed distribution of children who participated. Panel C reports the results from imputing the most favorable outcomes to the non-participant children, based on the 90^{th} percentile of the observed distribution. See notes from Table 2 for more details. $^{*}(p < 0.10)$,** $(p < 0.05)$,*** $(p < 0.01)$.