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## Maternal Life Satisfaction and Child Development from Toddlerhood to Adolescence

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# Maternal Life Satisfaction and Child Development from Toddlerhood to Adolescence

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## Abstract

We analyse how maternal life satisfaction impacts child development at different ages from toddlerhood to adolescence. Using the German Socio-Economic Panel, which captures maternal life satisfaction and various age-specific measures of child development, we identify a strong positive association between mothers' life satisfaction and their children's development when these are toddlers (2-3 years), of primary school age (5-10 years) and in adolescence (11-14 years). This relationship holds when we control for a wide range of potentially confounding factors, including education, employment, household income and maternal personality traits. We confirm our main findings using an instrumental variable estimation, where we instrument contemporaneous maternal life satisfaction with pre-birth levels, and with a value-added model leveraging the fact that some child outcomes are observed twice at different ages. Our findings suggest that mothers' life satisfaction is beneficial for their children's development at all ages and that it is fruitful for policy makers to identify measures through which maternal well-being can be raised. Looking at the association between paternal life satisfaction and child development, we find similarly sized coefficients for some outcomes, but smaller, statistically insignificant estimates for others.

**Keywords** life satisfaction · subjective well-being · mothers · child development · skill formation

**JEL classification** J13 · I22

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## 1 Introduction

Well-being is a strong predictor for a wide range of outcomes, such as productivity, educational attainment, fertility, migration, and longevity of individuals (e.g., Amholt, Dammeyer, Carter and Niclasen, 2020; Clark, Flèche, Layard, Powdthavee and Ward, 2018; Deaton, 2008; Diener, Oishi and Tay, 2018; Kaya & Erdem, 2021; Myrskylä & Margolis, 2014; Proto, 2016; Proto & Rustichini, 2015; St. John, Mackenzie and Menec, 2015). But while the positive influence of well-being on these factors is well documented, little evidence exists on the intergenerational link between the life satisfaction of parents and their children's short- and long-run outcomes.<sup>1</sup> Research on intergenerational links in outcomes, commonly dubbed as intergenerational mobility, initially focused on income and education (e.g. Blanden, 2013; Chetty, Hendren, Kline and Saez, 2014; Solon, 1999) with more recent studies also studying other outcomes such as physical (Graeber, 2023; Halliday, Mazumder and Wong, 2021) and mental health (Bütikofer, Ginja, Karbownik and Landaud, 2024; Clark et al., 2018). The scarce evidence on the association between a broader concept of parental well-being and child development, to date solely focusing on the first years of a child's life, is remarkable, as it is well-documented that parent-child interactions are of particular importance for child development (Del Bono, Francesconi, Kelly and Sacker, 2016; Fiorini & Keane, 2014). Higher levels of parental well-being may not only impact the *quantity*, but, perhaps more importantly, also the *quality* of these interactions. Besides directly affecting child development through the interactions, higher parental well-being can also have beneficial effects by reducing children's emotional problems and creating a more positive environment in the home; thus it might also be part of the home environment which influences child well-being (see also Conti & Heckman, 2012).

Given these insights, this paper investigates how maternal well-being, as measured by overall maternal life satisfaction, affects child development from toddlerhood to adolescence. Empirically, we first estimate OLS models controlling for a rich set of potentially confounding factors. In subsequent analyses, we estimate IV models and instrument current maternal life satisfaction with that measured before giving birth for the first time. For child outcomes measured twice, we additionally estimate value-added models. In all approaches, we identify a positive relationship between mothers' life satisfaction and their children's development.

We focus in our analysis on maternal life satisfaction as mothers are commonly still the primary caretakers and therefore the adult with whom young children spend the most time during the day. In fact, parental daily childcare time has been increasing strongly since the 1960s.<sup>2</sup> Given that young children spend increasingly more time with their mothers, and—albeit at lower levels—also with their fathers, a

<sup>1</sup> One exception is Clark et al. (2018), chapter 12, who show correlations between maternal mental health with child well-being, behaviour and intellectual development measured at ages 5-16.

<sup>2</sup> A study of 10 OECD countries showed a threefold increase in daily childcare time of both parents between 1965 and 2012, despite the rise of single parenthood and changes in female labour force participation over the last 50 years. Childcare time in the study included time spent supervising and playing with the child, washing, feeding and preparing food for the child and putting the child to bed. One exception however was France, where maternal childcare time decreased over time, see Dotti Sani & Treas (2016).

natural question to ask is how parental life satisfaction affects child outcomes measured both contemporaneously and at later ages. We also study the role of fathers' life satisfaction and report the results in the Appendix. Despite fathers mostly not being the primary caregivers, the association between fathers' life satisfaction and their children's outcomes is either roughly the same size or slightly smaller compared to that of mothers in the simple OLS models but unlike for mothers, loses significance in value-added models.

When it comes to maternal well-being, the psychological literature has primarily focused on negative and extreme measures, such as maternal depression, and how they affect child development. Large meta-analyses found that a mother's antenatal and postnatal mental problems can have negative effects on her child's cognitive, socio-emotional, language, motor and adaptive behaviour development, spanning from infancy to adolescence (Goodman et al., 2011; Rogers et al., 2020). However, these studies only identify correlations and may reflect the effect of confounding variables. Similarly, maternal psychopathology, such as maternal distress, has been found to be a source of systematic misreporting of child functioning. Mothers with depression rate their children's behavioural outcomes more harshly, thereby increasing parental discrepancies in ratings of the development of their child. Thus, the presence of mothers' mental disorders is a distorting factor in their reports on child behaviour and may affect their investments in the child (Datta Gupta, Lausten and Pozzoli, 2018). For example, they may be less engaged in the cognitive stimulation of the child and give less emotional support to their child as well. Sevim, Baranov, Bhalotra, Maselko and Biroli (2024) show that a perinatal intervention targeted at depressed mothers led to a transitory improvement in their children's socio-emotional development.

In contrast to previous studies, we consider a broader and more positive element of maternal well-being by focusing on life satisfaction. This approach differs from the previous literature as much less is known about positive measures and how they affect child development. The relationship between maternal well-being and child development may not run symmetrically in both directions; i.e., the effect of maternal distress or depression on child development is not necessarily the opposite of the effect of maternal life satisfaction. There is far less evidence on this positive measure of well-being aside from some correlational studies (see e.g. Augustijn, 2022; Brajša-Žganec & Hanzec, 2014; Phua et al., 2017).

A positive association between maternal life satisfaction and children's cognitive and socio-emotional development, particularly up to middle childhood, where decisions regarding educational tracks are made, would suggest an effective and potentially less costly policy initiative for improving child development compared to other interventions. By promoting mothers' satisfaction levels during the early years of a child's life, this may help reduce public expenditures related to child development issues, such as the need for external educators or special needs teachers. Ultimately, such policies can have far-reaching effects on labour market outcomes, health, and social outcomes in later life. As is the case for other (early) childhood interventions, these policies may pay for themselves (e.g. Hendren & Sprung-Keyser, 2020).

Life satisfaction is a widely used and accepted concept for measuring well-being in medical and social sciences. The consensus in the psychology literature is that

while well-being or happiness levels are relatively stable and tend to fluctuate around a fairly stable set-point, major life events do indeed shift happiness levels (Clark & Oswald, 2002; Diener, Lucas and Scollon, 2009). Empirical evidence shows that life-events such as marriage, childbirth, unemployment, divorce, widowhood and disability are all associated with marked changes in happiness levels (Anusic, Yap and Lucas, 2014).<sup>3</sup> A shift in well-being levels may have a permanent effect on the individual's children, including on their human capital formation. If this association can be identified, we can also learn more about potential channels of other shocks during early childhood affecting child outcomes and child development, such as maternal unemployment (Kalil & Wightman, 2011) or family instability (Fomby & Cherlin, 2007; Peter & Spiess, 2016).

It is a well-documented finding that the early years are crucial for child development. Many studies for various countries have shown that early investments are particularly effective; James Heckman and co-authors point out that this is particularly true due to the double complementarity of early skill investments (Cunha, Heckman, Lochner and Masterov, 2006). This is relevant for cognitive and non-cognitive skills (Heckman, 2006), which have been found to be powerful predictors of adult life satisfaction (Heckman, Stixrud and Urzua, 2006; Layard, Clark, Cornaglia, Powdthavee and Vernoit, 2014).

Studies on the effects of the input of caretakers and educators outside the family mainly focus on the effects of formal childcare (e.g. Cornelissen, Dustmann, Raute and Schönberg, 2018; Datta Gupta & Simonsen, 2010; Havnes & Mogstad, 2011, 2015) or on the effects of informal care provided by grandparents living outside the child's household (e.g. Barschkett, Spiess and Ziege, 2025). Complementary to this, the literature on the input from caretakers and educators in the family focuses on issues such as the effects of maternal time investments (Del Bono et al., 2016; Nicoletti & Tonei, 2020), parental leave expansions (Danzer, Halla, Schneeweis and Zweimüller, 2022; Huebener, Kuehnle and Spiess, 2019), reading to children (Kalb & Van Ours, 2014; Price & Kalil, 2019) or maternal employment (Bastian & Lochner, 2022; Hsin & Felfe, 2014). Overall, the literature highlights the importance of early investments in cognitive and non-cognitive skills for child development, particularly those made by caretakers and educators during the early years of a child's life.

Among the few studies trying to establish a causal link between maternal life satisfaction and child outcomes in a more causal direction are those by Berger & Spiess (2011) and Richter, Bondü, Spiess, Wagner and Trommsdorff (2018). Berger & Spiess (2011) show that maternal well-being positively affects the adaptive and socio-emotional behaviour of their young children up the age of 6 (Richter et al., 2018, similarly focus on younger children). The relationship is found to be more pronounced for boys and results are robust to accounting for mothers' personality and controlling for their cognitive skills. However, there is no evidence up to now on whether the association is long lasting or whether it fades out over time (Headey, Muffels and Wagner, 2014), as only young children's outcomes are considered in those studies—a gap we seek to fill in this paper.

<sup>3</sup> E.g., research from Germany has shown that average life satisfaction of employed and unemployed workers differs by about 1.3 on a scale from 0 to 10 (Wulfgramm, 2014).

Compared to the existing literature, we adopt a longer-term perspective and examine the link between maternal well-being and their children's development up to age 14. At this stage, mothers tend to spend considerably less time with their children and the importance of their interactions is not well established in the literature. Moreover, we extend the analysis beyond socio-emotional skills, and assess the influence on a range of outcomes, including cognitive skills, socio-emotional behaviour, children's personality traits, their self-reported own well-being and test scores. In contrast to Berger & Spiess (2011), we are thus able to provide the first insights on the intergenerational effects of well-being from one generation to the other covering a long time period and a comprehensive set of outcomes including non-cognitive and cognitive skills. Third, we also add to the study by Berger & Spiess (2011), who considers children up to age six, by studying the relationship between maternal life satisfaction and child outcomes with a much larger sample. Fourth, in contrast to Berger & Spiess (2011) we also examine the role of fathers' life satisfaction. Fifth, we additionally verify our results by a value-added model. Sixth, we provide further analysis on potential mechanism for the associations we find, such as differences in parental activities.

In the empirical analysis, we regress indicators of child development on maternal life satisfaction. In our estimation we control for a range of factors that may confound the relationship between maternal life satisfaction and child outcomes, such as household income, maternal education, time spent in formal childcare and family structure. These variables are highly predictive of child outcomes and similarly correlated with maternal life satisfaction, but adding these controls has at best a minor impact on our estimates of maternal life satisfaction. In our preferred specification, we additionally account for mothers' personality traits. This slightly depresses the coefficients, but the point estimates are qualitatively similar. As mothers' life satisfaction may be endogenous and the relationship to child development could run in the other direction, we also present instrumental variable (IV) estimates following the approach by Berger & Spiess (2011). Specifically, we instrument the contemporaneous life satisfaction of mothers with their life satisfaction measured two years *prior* to her first childbirth. Through this, the potential reverse causality of the well-being measure vanishes and the issue of measurement error due to short-run fluctuations is mitigated. As this estimation requires mothers to be in the panel over a long time period, it reduces the sample substantially by more than 80%. These estimates are therefore noisier, but on the whole consistent with our main findings.

We observe child development indicators of primary school-aged children and of adolescents twice per child, allowing us to also estimate simple value-added models.<sup>4</sup> While the outcomes exhibit a significant auto-correlational element over time, our results suggest that contemporary maternal life satisfaction still plays a crucial role for child development but that past maternal life satisfaction does not have an

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<sup>4</sup> The sample size drops again invariably as mothers must have been interviewed twice about their children for the respective outcomes. Depending on the time period, the sample size drops to 23 and 32% of the original estimation sample, but as it takes the lags of previous realisations of the variables into account, this means that 46 and 64% of the observations used in the main specifications are part of this estimation.

additional effect on child development except through its direct effect on past child outcomes.

To provide a glimpse of our findings, a one-point higher maternal life satisfaction on a scale from 0-10 is associated with a 0.03 standard deviation (SD) improvement in toddlers' (aged 2-3) skill attainment measured by Vineland Adaptive Behavior (VAB) scores across four domains. For school-aged children (5-9 years), we identify positive effects on socio-emotional and pro-social behaviour as well as increases in all mother-reported Big 5 personality traits of children (neuroticism is reverse coded). The coefficient on socio-emotional behaviour is 0.06 SD while the average increase in the Big 5 scores is around 0.03 SD.<sup>5</sup> Our analysis of adolescents (11-14 years) shows that higher maternal life satisfaction is associated with a 0.16 SD increase in their life satisfaction, which is the largest association and thus indicates how important maternal life satisfaction might be for the next generation's life satisfaction. We additionally find for adolescents higher school grades and higher scores in their self-reported Big 5 in a range of around 0.02 SD.<sup>6</sup> Importantly, adolescent outcomes are self-reported thus alleviating concerns about the association being driven by more satisfied mothers judging their children more favourably.<sup>7,8</sup>

In the following section 2, we present the data. We delineate our empirical strategy in section 3 and present our results in section 4. Section 5 concludes.

## 2 Data

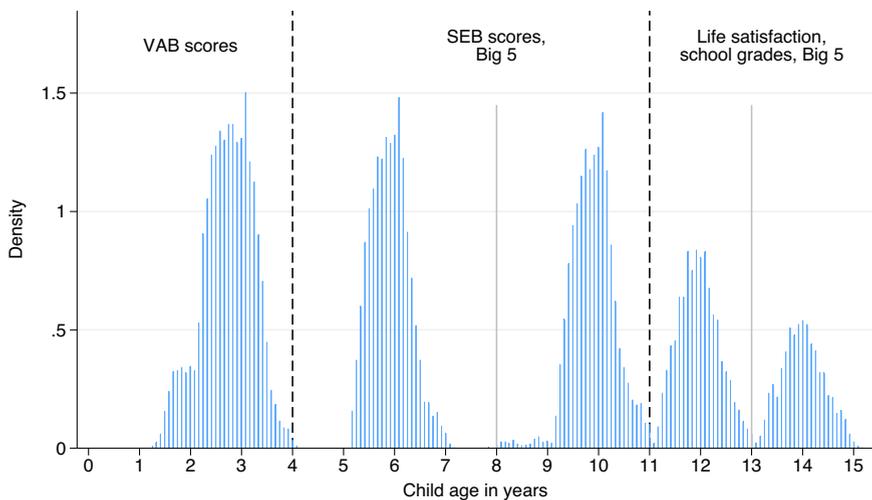
Our analysis uses the German Socio-Economic Panel (SOEP, Goebel et al., 2019). SOEP is a longitudinal household survey running annually since 1984. In recent years, around 15,000 households and 35,000 individuals are included. SOEP contains information on a wide range of topics, such as labour market outcomes, socio-demographic characteristics, detailed information on children, and information on life satisfaction and personality traits of respondents.

<sup>5</sup> While a larger number of other studies have also examined the effects of diverse factors on children's Strength and Difficulties Questionnaire (SDQ) and other non-cognitive and cognitive outcomes (see, e.g., Borra, Iacovou and Sevilla, 2012; Del Bono et al., 2016; Doyle, Harmon, Heckman, Logue and Moon, 2017; Lekfuangfu, Powdthavee, Clark and Ward, 2015; Peter, 2016; Peter & Spiess, 2016), the magnitude of coefficients are inherently hard to compare across studies; only some studies standardise outcomes and some surveys use modified versions of the scales with different or a reduced number of questions. An additional difficulty is that in some studies the main explanatory is a binary indicator (such as a home visiting programme or parental job loss in Doyle et al., 2017; Peter, 2016, respectively) and in other cases continuous variables (e.g., maternal time investments in Del Bono et al., 2016).

<sup>6</sup> Once we correct for multiple hypothesis testing, coefficients for two instead of four out of five personality traits remain statistically significant. For all other outcomes studied in our paper, accounting for multiple hypothesis testing has a negligible influence on p-values.

<sup>7</sup> The scales we use for younger child ages are based on judgements by mothers. These are well-established measures and have been proven to be valid measures of child outcomes.

<sup>8</sup> In Appendix Tables 6 and 7 we report the correlation coefficients between mothers' Big 5 personality traits and that of their children measured at 5-10 years, which is based on maternal judgement, and at child age 11-14 years where children's Big 5 is self-reported. We identify no systematic patterns that the correlations are smaller or larger at any child age, alleviating concerns that mothers are more prone to judge their children's personality as resembling their own.



**Fig. 1** Age distribution of children with psychometric measures. *Notes:* Figures shows the age distribution of children for which child development indicators (psychometric measures or school grades) and information on maternal life satisfaction are available. Survey years are 2005 to 2020, children in the sample are born between 2000 and 2018. Source: SOEP v37

SOEP is particularly suited to our analysis as in 2005 a new set of questionnaires assessing the development of children was added ("mother & child", "parent", "pre-teen" and "early youth" questionnaires, see Spiess, 2011). These age-specific questionnaires contain an extensive range of well-established psychometric measurements described in the following paragraphs. As no single, unified instrument exists to validly and reliably assess development continuously from birth through adolescence, we use the age-appropriate measures included in SOEP. All child outcome measures are standardized and thus can be interpreted in their effects on the standard deviation of the corresponding outcome measure. Richter, Metzging, Weinhardt and Schupp (2013) document in detail how each of the scores we use are constructed. Figure 1 plots the child age distribution in years, for which age-specific measurements of child development are contained in the SOEP data.<sup>9</sup> For children up to eleven years the metrics are based on parental responses, for children above that age the measures are based on the children's own responses. Appendix Fig. 7 illustrates the timing of the SOEP questionnaires covering child development outcomes. As described below, we predominantly analyse non-cognitive skills as these have been found to be more persistently affected by parents (e.g. Cunha & Heckman, 2008; Heckman et al., 2006). Moreover, the literature shows that cognitive skills tend to be more malleable in early life, while non-cognitive skills continue to be shaped over time, especially by the family environment and thus parental satisfaction as well.

For 2-3-year-old children (toddlers) skill attainment is measured with the Vineland adaptive behaviour scales (VAB, Sparrow, Balla and Cicchetti, 1984; Sparrow &

<sup>9</sup> In Appendix Fig. 6 we show how much time mothers are spending with their children overall and specifically on interactive child care activities using German time-use data from 2012/13. Both indicators of time use decrease continuously with child age.

Cicchetti, 1989). The outcomes are measures of early skill attainment. Collectively they are a modification of the German Vineland scale (Tietze, 1998). In each of four areas – verbal skills, activities of daily living, motor skills, and social skills – mothers (fathers only in exceptions) were asked to rate their child’s ability to perform five skills as either yes, to some extent, or no. Each individual score is calculated as an equally weighted average of these responses. In addition to the individual scores, we also provide results for a summary VAB score. Similar to all other outcomes considered, we standardise the indices to have a mean of 0 and a standard deviation (SD) of 1, such that the coefficients can be directly interpreted and compared.

For older, primary school-aged children, 5-6 and 9-10 years, we consider the socio-emotional behaviour (SEB) of children, which is measured with the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997). Socio-emotional behaviour is an aggregate of hyperactivity, emotional symptoms, conduct problems and peer problems (for ease of interpretation the score is reverse coded such that a positive coefficient reflects a desired outcome and we refer to this outcome as “Socio-emotional score”). We also use a score for prosocial behaviour. Besides the SEB scores, at this age children’s Big 5 personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism, Costa Jr. & McCrae, 1995) are measured where each of the traits is based on two questions. It has been well-documented in psychological studies that the Big 5 personality traits are age-dependent, in particular in the age ranges we look at. Overall empirical studies show that personality changes throughout the life span, with more pronounced changes in young and old ages (see Specht, Egloff and Schmukle, 2011).

Once the children turn twelve during the calendar year of the survey, it is they themselves who respond to the questionnaires. For 11-14-year-old children (adolescents) we use the outcomes life satisfaction, school grades (German, maths and in a foreign language), as well as their Big 5 personality traits. The Big 5 for these older children are based on three questions each and also answered by the children themselves.

Maternal life satisfaction is the main explanatory variable in our study. The question on “satisfaction with life in general” is asked in every survey year on a Likert scale ranging from 0 to 10 with higher values indicating a higher life satisfaction. Appendix Fig. 8 plots life satisfaction of mothers and childless women over the life cycle. Life satisfaction is somewhat higher for mothers from the mid-20s onward before reaching a similar level at age 40. Overall there is no indication that mothers are a selected group with regard to life satisfaction. We describe in the following section 3 how we specify maternal life satisfaction in different ways in our empirical models to identify the link between life satisfaction and our different (psychometric) measures of child development.

### 3 Estimation

To identify the relationship between maternal life satisfaction and child outcomes, ideally one would exploit some (quasi-) experimental variation in life satisfaction holding other confounding factors constant. Regrettably, we are not aware of such variation which would allow for a clean estimation of the causal impact on child

development. Thus, we turn to the second-best approach and estimate several models where we control for a rich set of covariates in order to establish the conditional association of child development at different ages and maternal life satisfaction. In a first step, we estimate the following simple regression model:

$$y_{i,t} = \beta_0 + \beta_1 LS_{i,t} + \beta_2 X_{i,t} + \beta_3 \text{Big5}_{i,t} + \epsilon_{i,t} \quad (1)$$

where  $y_{i,t}$  is an age-specific measure of development of child  $i$  measured in survey year  $t$ . To simplify the indices, we use the same subscript  $i$  for children and their mothers, i.e. effectively for a child-mother-nexus. The coefficient of interest is  $\beta_1$  which measures the conditional association between maternal life satisfaction and standardised child outcomes.

The vector  $X_{i,t}$  contains a rich set of control variables on the mother-, child- and household-level measured at the same time as the outcomes: age of mother, born in Germany (0/1), relationship status of the mother, employment status, education dummies for mother and her partner (if applicable), (log) household income, age of child, child sex, time spent in formal childcare (if applicable), and survey year dummies to account for general time effects. By accounting for these characteristics, we can abstract from many distorting factors that are likely to affect both child development and maternal life satisfaction (e.g. both education and household income are positively correlated with child development and maternal life satisfaction).<sup>10</sup> Our estimates come from unweighted regressions, but our preferred specification controls for a richer set of covariates than those used to calculate the weights in the SOEP (Steinhauer, Kroh and Goebel, 2020).

We additionally control for mothers' Big 5 personality traits. We use the Big 5 as control variables rather than as explanatory variables of interest as, being largely time-invariant characteristics in the age range of mothers,<sup>11</sup> there is little scope for policy to impact these (although the role of maternal Big 5 on child development may naturally be of interest in its own right). In our estimation, we control for the Big 5 traits as we want to isolate the effect of maternal life satisfaction on child development by netting out the relationship between the personality traits and life satisfaction and to control for heritability.<sup>12</sup>

An obvious issue of our estimation is that the measure of *general* maternal life satisfaction is likely to not only capture overall satisfaction but may also reflect *short-run fluctuations*. If the measurement error is random, this will bias estimates towards zero (Griliches & Hausman, 1986). To reduce measurement error in the explanatory variable, in one specification we replace  $LS_{i,t}$  with an average of the measures of life satisfaction of the current, and the previous two survey years, i.e.  $LS_{t-2,t-1,t}$  for

<sup>10</sup> Previous research argues that individual well-being is affected by relative considerations such as the income level of a reference group (Clark, Frijters and Shields, 2008). However, there is little agreement as to what constitutes the appropriate reference group (i.e., coworkers, neighbours or even one's past self). Given the lack of consensus on this issue and the fairly low level of geographical detail in the SOEP, we do not control for comparison income.

<sup>11</sup> Cobb-Clark & Schurer (2012) demonstrate the stability over four-year periods with negligible mean population changes. In a meta-analysis covering hundreds of studies, Bleidorn et al. (2022) confirm that personality traits stabilise in young adulthood.

<sup>12</sup> Appendix Fig. 9 illustrates the well-established (Diener, Oishi and Lucas, 2003) correlation between maternal life satisfaction and her Big 5 personality traits in our data.

whichever of these are available. This is similar to other studies analysing life satisfaction (e.g. Headey et al., 2014) or to studies analysing intergenerational mobility, which often average parental earnings over several years (Solon, 1999).

However, this does not address another, arguably larger, concern: Reverse causality between child development and maternal life satisfaction.<sup>13</sup> Positive measures of child development could increase mothers' life satisfaction, as they make them proud of having children with high ability and could also reduce concerns about whether her child is developing adequately. This would lead  $LS_{i,t}$  to be positively correlated with the error term  $e_{i,t}$  which impedes a consistent estimation of  $\beta_1$ .

To circumvent this, we follow Berger & Spiess (2011) and instrument contemporaneous maternal life satisfaction in survey year  $t$  with her life satisfaction measured two years *before* her first birth,<sup>14</sup>  $LS_{i,fb-2}$ . By using a pre-motherhood measure of life satisfaction, we can address both the issue of reverse causality—even unexpected problems arising during pregnancy which affect child development should not have influenced pre-birth life satisfaction—and also the issue of measurement error. The instrumental variable rests on two main assumptions; (i) the instrument causes variation in the instrumented variable ("relevance", this can be statistically tested) and (ii) the instrument has no direct effect on the outcome variable other than through the indirect effect of the treatment variables ("exclusion", Angrist & Pischke, 2009). Formally we estimate the following first-stage regression:

$$LS_{i,t} = \gamma_0 + \gamma_1 LS_{i,fb-2} + \gamma_2 X_{i,t} + \gamma_3 Big5_{i,t} + u_{i,t} \quad (2)$$

and replace  $LS_{i,t}$  in eq. (1) with the predicted value  $\widehat{LS}_{i,t}$  obtained from eq. (2). For this estimation the panel structure of the SOEP data is crucial as respondents are often observed in the survey over many years and even decades. Yet, as we require both contemporaneous measures of life satisfaction and child development, as well as pre-birth measures of life satisfaction, the sample size is naturally reduced substantially and more so for outcomes measured at older child ages. To assess whether differences in coefficients stem from the reduced sample or the estimation strategy, we also show estimates based on the specification shown in eq. (1) using the sample of the instrumental variable estimation. While from an identification point of view the instrumental variable estimation might be seen as preferable, it comes with the downside of less precisely estimated coefficients and lower sample sizes. In this paper, we therefore first show the plain OLS results obtained from eq. (1) as the main estimates and are careful to interpret them as conditional associations rather than as causal effects. In a second step, we present estimates from the averaged measure of life satisfaction and from the instrumental variable specification to support that the conditional associations we estimate may indeed have the flavour of a causal relationship.

<sup>13</sup> Another potential concern is that more satisfied mothers judge their children more favourably. We cannot directly account for this in our estimation, but as we also identify positive coefficients for objective outcomes (school grades) and children's self-reported outcomes, we do not believe that this is a major issue in our analysis.

<sup>14</sup> The first birth can refer to a different birth than that of the child for which outcomes are estimated. This allows us to avoid distortions due to changes in life satisfaction related to any other sibling of the child of interest.

For primary school-aged children (5-10 years) and adolescents (11-14 years) we observe some development indicators twice at different ages. This enables us to estimate a simple value-added model where in line with the notion that child development is a cumulative process we account for lagged inputs (lagged maternal life satisfaction) as well as the lagged child development as a baseline development measure (Koedel, Mihaly and Rockoff, 2015; Todd & Wolpin, 2003). Note that this is akin—but not identical—to including child fixed effects in the estimation covering two periods. We estimate the following equation:

$$y_{i,t} = \delta_0 + \delta_1 y_{i,t-h} + \delta_2 LS_{i,t} + \delta_3 LS_{i,t-h} + \delta_4 X_{i,t} + \delta_6 Big5_{i,t} + v_{i,t} \quad (3)$$

where  $\delta_1$  identifies the effect of the child development indicator measured  $h$  years earlier and  $\delta_3$  how past maternal life satisfaction impacts on current child outcomes besides its effect on past child development. The main coefficient of interest is  $\delta_2$ . This model also nets out the effect of any selectivity induced by heritability. For instance, if parents attain a higher level of education, higher income and higher life satisfaction due to their genes, and in turn their children are exposed to a better environment and higher family income growing up, then the estimated coefficients could simply reflect favourable parental genetics. The value-added model, by controlling for an earlier measure of the child's score, captures all time-invariant factors including fixed genetic traits inherited from the parents. If this model yields similar results to the simple model, it will indicate that genes are not the main driver underlying the estimated association of maternal life satisfaction and child outcomes.<sup>15</sup>

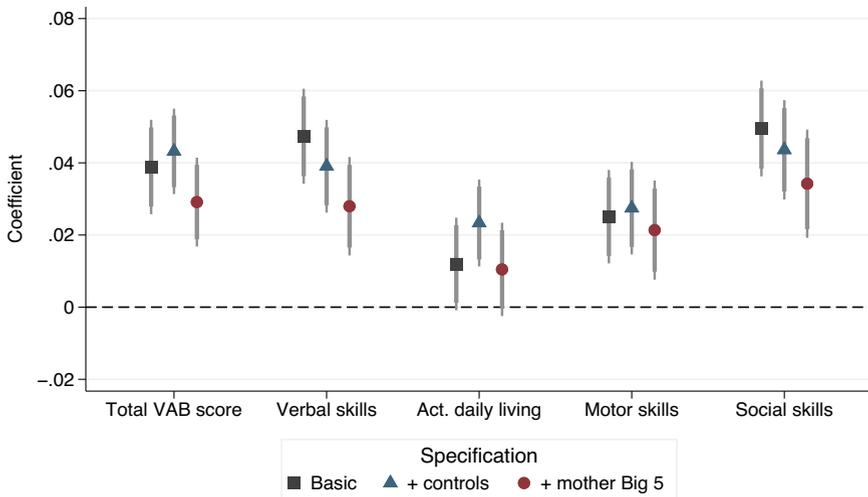
## 4 Results

We present results for various child ages starting with toddlers (2-3 years) up to adolescents (11-14 years) where we examine different age-appropriate psychometric measures of child development. For each age group, we start by reporting coefficients of several OLS models, before we turn to the IV estimation and value-added models (if feasible).

### 4.1 Toddlers (2-3 years): VAB Scores

Figure 2 reports the coefficients of contemporaneous maternal life satisfaction on VAB scores. Dark grey squares show the raw correlation, blue triangles include controls at the mother-, household- and child-level (see figure notes), and maroon circles—our preferred specification—additionally include the Big 5 personality traits of mothers in the estimation. Overall we find that the coefficients do not differ fundamentally between the specifications, but there is a tendency, although differences are not statistically different from one another, for the inclusion of mothers'

<sup>15</sup> While genetics themselves are time-invariant, a potential limitation that we are not able to address is that the effect of genes on cognitive ability or other indicators of child development may be age-specific and interacting with environmental inputs, which has been documented in the psychological literature (Briley & Tucker-Drob, 2013; Haworth et al., 2010). Shared genetics by mothers and their children could then still contribute to the associations even when accounting for child outcomes measured at younger ages.



**Fig. 2** Coefficients of maternal life satisfaction on children's VAB scores (2-3 years). *Notes:* Figure shows coefficients of contemporaneous maternal life satisfaction on various indicators on child development obtained from estimating eq. (1). All child outcomes are standardised. Control variables at mother level: age, born in Germany, relationship status (married, partner, no partner / unknown), employment status (full-time, part-time, marginal or unemployed), education and partner's education (university, vocational or no degree), log household income. Control variable at child level: age, sex, hours in formal childcare (none, 1-20, 21-30, 31+). All estimates include survey year fixed effects. Range plots indicate 90% (thick line) and 95% (thin line) confidence intervals. Source: SOEP v37

personality traits to move coefficients towards zero. In Appendix Fig. 10 we present Romano & Wolf (2005) adjusted p-values accounting for multiple hypothesis testing, which changes little for this age group.

A one-point increase in maternal life satisfaction on the 11-point Likert scale is associated with a 0.03 standard deviation (SD) increase in the VAB score in our preferred specification. Looking at the individual contributions to the score, substantial increases are identified for all scores with the exception of activities of daily living for which we cannot reject that the coefficient is zero.

To put the size of the coefficients into perspective, a one-unit higher life satisfaction corresponds to an increase in the VAB score that would result from the mother having obtained 1.6 additional years of formal schooling (the coefficient for maternal education is 0.0184,  $\frac{0.03}{0.0184} = 1.6$ ). We investigate heterogeneities by child gender in Appendix Fig. 11. The literature on the child development effects of e.g. formal childcare often identifies such differences (see a discussion of this literature in, e.g., Datta Gupta & Jessen, 2023), but we see no evidence for such differential effects. In all analyses, we similarly find no heterogeneity by birth order of the child, and no consistent patterns as to whether the association differs by household income, or in earlier or later years of our sample.

In Appendix Fig. 12 we assess the (additional) role that the life satisfaction of fathers, commonly the secondary caregiver, plays for child development. The analysis is restricted to observations where both parents' life satisfaction is observed. (The correlation coefficient between mothers' and fathers' life satisfaction is 0.453.) We first contrast the coefficient for maternal life satisfaction when that of fathers is

**Table 1** VAB scores—Specifications of maternal life satisfaction (child age: 2-3 years)

	Total VAB score (1)	Verbal skills (2)	Act. daily living (3)	Motor skills (4)	Social skills (5)
Life satisfaction <sub><i>t</i></sub>	0.030*** (0.006)	0.033*** (0.007)	0.009 (0.006)	0.020*** (0.007)	0.037*** (0.008)
N	8112	8104	8109	8108	8109
Life satisfaction <sub><math>\overline{t-2,t-1,t}</math></sub>	0.035*** (0.007)	0.036*** (0.008)	0.010 (0.008)	0.022*** (0.008)	0.047*** (0.009)
N	8154	8146	8151	8150	8151
Life satisfaction <sub><i>t</i></sub> (IV sample)	0.022 (0.015)	0.016 (0.014)	0.013 (0.016)	0.012 (0.015)	0.023 (0.015)
N	1554	1554	1554	1554	1554
Life satisfaction <sub><i>t</i></sub> (IV <sub><i>fb-2</i></sub> )	0.042 (0.052)	0.079 (0.051)	– 0.030 (0.058)	0.058 (0.054)	0.061 (0.058)
F-statistic of first stage	99.535	99.535	99.535	99.535	99.535
N	1554	1554	1554	1554	1554

First row of estimates contains contemporaneous maternal life satisfaction similar to the maroon circles in Fig. 2. Rows below use life satisfaction two survey years before. 2nd row shows the available average of life satisfaction over three years, if not all waves are covered, average is taken over the ones included. 3rd shows estimates for contemporaneous life satisfaction with the same sample as the following IV estimates. IV estimates instrument contemporaneous life satisfaction with life satisfaction 2 years before the first birth (*fb*). All estimates include control variables. Robust standard errors in parentheses, \*\*\* < 1% Source: SOEP v37

added (circles and squares) and find only a small difference. In a second step, we show estimates for the correlation between father's life satisfaction and child development (blue diamonds) where we now control for father's Big 5 personality traits. For four of the five outcomes, the coefficients become smaller in size and in fact, insignificant in two cases (verbal skills, activities of daily living) while for the motor skills, and to a lesser degree social skills, they retain their size and significance. That fathers matter particularly for motor skills has also been found by Kato et al. (2024). Fathers are on average relatively more involved in physical activities with their children, thus their happiness might affect the sport related activities they do with the children.

In Table 1 we consider different specifications of maternal life satisfaction as outlined in section 3. As a reference, the first row contains the same estimates as the full specification including control variables and maternal personality traits in Fig. 2 (maroon circles). The second row uses the average of the contemporaneous life satisfaction and that of the two preceding survey waves to reduce measurement error in the explanatory variable caused by short-term fluctuations. The estimates are statistically unchanged although consistently larger, which could be due to less measurement error in the main explanatory variable if it is averaged over several years. The bottom rows introduce the instrumental variable estimates. In the third row we first use the same specification of the first row, but use the same sample as in

the IV estimation in the final row to contrast the estimates with the identical samples. The sample size is reduced by 80%<sup>16</sup> which reduces the precision of the estimates; point estimates are smaller, though they all point in the same direction.

The last row finally reports the IV estimates, where the current life satisfaction of mothers is instrumented with her life satisfaction two years before her first birth (observed at least four years earlier). The F-statistic of the excluded instrument of almost 100 meets even the conservative thresholds discussed more recently (Lee, McCrary, Moreira and Porter, 2022) and confirms the relevance of the instrument. Appendix Table 9 shows the first-stage regressions for all IV estimates. The instrumented coefficients for life satisfaction are larger for all outcomes except for activities of daily living, but as standard errors are inflated about seven- to nine-fold, none of the estimates are statistically significant at conventional levels. While we lack precision in the IV approach in the last two rows to make definite statements using this estimation strategy, because the confidence intervals of the IV and OLS estimates all overlap, we nonetheless interpret the coefficients as supporting the conclusion that maternal life satisfaction is positively associated with indicators of child development for toddlers.

The result leads to the next question; is it life satisfaction itself or something that it closely proxies which similarly affects child development? Our data and setting do not allow us to provide a definitive answer on this, but the rich data nevertheless permit some insights. A higher maternal life satisfaction may imply that this enables her to be more engaged and active in her parenting. Fortunately, for children aged 2-7 years SOEP asks parents how regularly they are conducting a list of 13 activities with their children (ranging from daily to never in a four-point scale). From these responses we create two standardised parental activity indices; the first index consists of all activities whereas the second focuses on activities that according to the literature (e.g. Del Bono et al., 2016; Kalb & Van Ours, 2014; Mayer, Kalil, Oreopoulos and Gallegos, 2019; Price & Kalil, 2019) ought to be particularly development enhancing for children (singing to and with the child, handicraft work, reading stories, looking at picture books and playing games together).

In Appendix Fig. 13, panel (a), we first show that these indices are indeed strong predictors of VAB scores. We estimate the same specification as for contemporaneous life satisfaction including control variables and maternal personality traits, and additionally include the parental activities index in two separate estimations. The summarising VAB score increases by 0.2 SD when our preferred parental activity index 2 is 1 SD higher. In line with the vast literature showing that parenting activities matter greatly for child development, our indices appear to capture something meaningful. In panel (b) of Appendix Fig. 13 we then plot coefficients for

<sup>16</sup> The reduced sample size is due to panel-attrition, new sample refreshments and the requirement that we need information two years before first birth. E.g., for the IV estimation of a child aged three years, it is required that their mother has been in the SOEP survey for at least five years with non-missing information on life satisfaction. We compare characteristics of the main estimation sample and the IV sample of all analyses in Appendix Table 8. In most dimensions the sample in this analysis, columns (1) and (2), look very similar, with the main exceptions being that in the IV samples mothers are more likely to have been born in Germany, more likely to be working part-time and to be university educated. We also see for older age groups that the IV samples are more positively selected. Note that we control for all these characteristics displayed in the table in our estimation.

contemporaneous maternal life satisfaction when we additionally control for the parenting indices.<sup>17</sup> The point estimates for maternal life satisfaction are only very slightly reduced when the parenting indices are added to the estimation. Maternal life satisfaction does not work only through the channel of improving the *frequency* of development-enhancing child care activities. But it may of course be that a higher life satisfaction improves the *quality* of these interactions and we do not argue that life satisfaction and parenting activities are mutually exclusive explanations, but that an increase in the quality of interactions might be a mechanisms explaining the positive association.

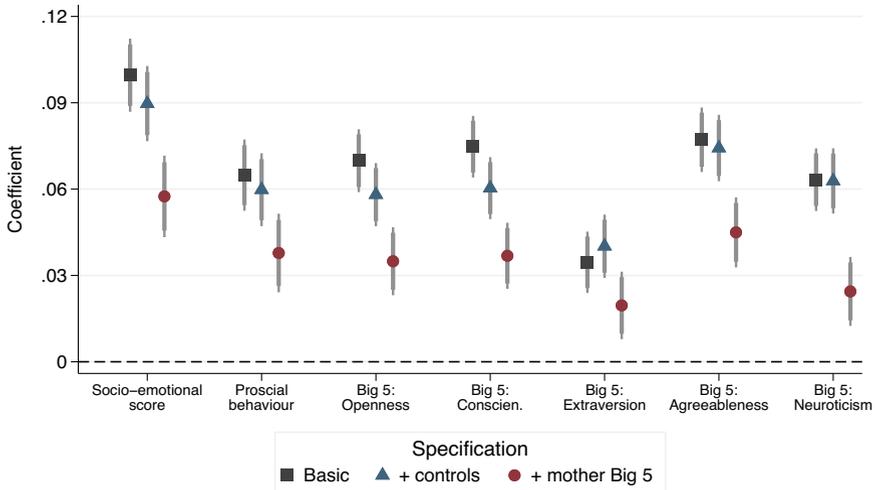
## 4.2 Primary school-aged children (5-6 and 9-10 years): SEB Scores and Big 5

We move on and now consider outcomes of children of primary school age, for which the SDQ scores and Big 5 personality traits of children based on responses by their mothers are covered in the age-specific questionnaire. For these outcomes, the indicators of child development are assessed at two different age brackets (see Fig. 1). For brevity in the exposition of results in the main text, we pool both age groups and show the corresponding coefficients. In the Appendix we report estimates separately for the two age groups. We also take advantage of the panel structure and that these outcomes are measured twice for children at different ages and estimate a value-added model in an attempt to disentangle whether contemporaneous maternal life satisfaction still matters once we control for lagged indicators of child development and whether past life satisfaction still has an impact beyond what is captured by the lagged outcome (which we argue is directly influenced by past life satisfaction).

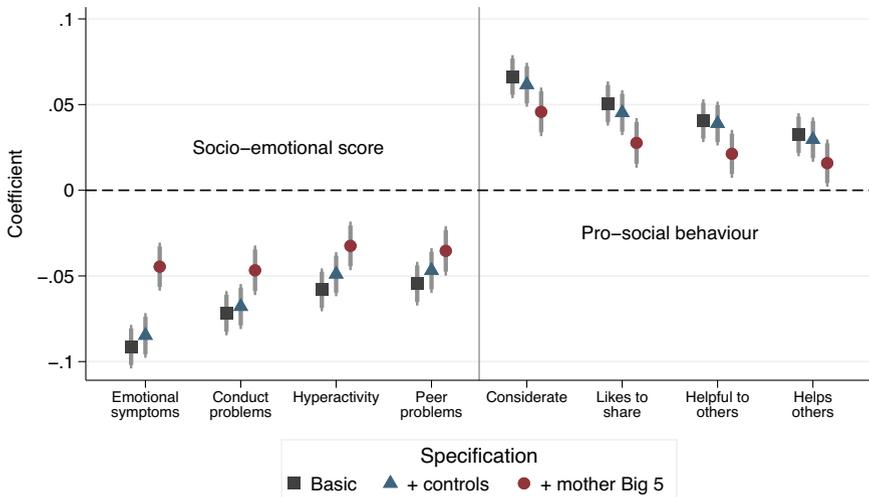
Estimates for the socio-emotional score, prosocial behaviour and Big 5 personality traits (neuroticism reverse coded) of children are shown in Fig. 3. In contrast to the estimates for toddlers (Fig. 2) we see that controlling for mothers' Big 5 has a much stronger impact on the coefficients, reducing them to about half on average compared to the raw correlation. Higher maternal life satisfaction is associated with a higher socio-emotional score of 0.06 SD, prosocial behaviour and child Big 5 increase by about 0.03 SD on average. Interestingly, the coefficients for the standardised outcomes are at least as large (or larger) than for toddlers, although mothers of older children spend substantially less time with their children at this older age (see Appendix Fig. 6). As for the VAB outcomes for toddlers, a one-unit increase in life satisfaction corresponds to mothers having just above 1.6 more years of schooling.

In Fig. 4 we also report the individual contributions to the socio-emotional score and pro-social behaviour as associations might be limited to specific components (see, e.g., Borra et al., 2012; Fitzsimons & Vera-Hernández, 2022, who study the effect of breastfeeding on cognitive and non-cognitive outcomes). The correlation with a reduction in the individual elements of the socio-emotional score is largest for

<sup>17</sup> In Appendix Fig. 14 we also conduct a mediation analysis in the spirit of Imai, Keele and Tingley (2010) where we decompose the total "effect" of maternal life satisfaction (moving from the 25th to the 75th percentile) into a so-called direct "effect" and an "indirect" effect running through higher parental investments. With the exception of the outcome *Activities of daily living*, where the main effect is not statistically different from zero, we find that 68 to 79% of the total "effect" comes through the direct "effect" implying that only smaller share comes through the relationship with parental investments.



**Fig. 3** Coefficients of maternal life satisfaction on children’s SEB scores and Big 5 (5-10 years). *Notes:* Figure shows coefficients of contemporaneous maternal life satisfaction on various indicators on child development obtained from estimating eq. (1). All child outcomes are standardised. See Fig. 2 for other notes. Source: SOEP v37



**Fig. 4** Contributions to socio-emotional score and pro-social behaviour (5-10 years). *Notes:* Figure shows individual contributions to the socio-emotional score and pro-social behaviour reported in Fig. 3. See Fig. 2 for other notes. Source: SOEP v37

children’s emotional symptoms, but mothers’ Big 5 mediates this correlation and controlling for her personality traits leads to an equally large coefficient for all four components of about 0.04 SD. For pro-social behaviour the association with being considerate is larger than the other indicators even when accounting for mother’s Big 5.

When considering children aged 5-6 and 9-10 years separately in Appendix Fig. 15, no clear pattern emerges for differential effects by age of child with, if anything, suggestive evidence that the positive association with prosocial behaviour is larger for *older* children who are mandated to attend primary school at this age. We find no differences by children's gender (Appendix Fig. 16). As for toddler outcomes, the coefficients for father's life satisfaction point all point in the same positive direction, but are (insignificantly) smaller than mother's coefficients (Appendix Fig. 17.)

Results for different specifications of maternal life satisfaction are reported in Table 2. The averaged life satisfaction indicator yields estimates that are larger than the main estimates by around 0.01 SD on average. In contrast to the estimates for toddlers, coefficients for the IV sample are quite similar to the estimates using the full sample. The IV estimates in the bottom row are large, but again quite noisily estimated. Despite the large point estimates, we cannot reject the equality of the coefficients to those from the model in the first row. For most outcomes, the IV estimates are statistically significant at the 5% or 10% level. Even at this older age, it thus seems as if maternal life satisfaction positively impacts on child development.

We next turn to the value-added estimation as for most children the outcomes are first measured at age 5-6 and then again usually four years later at ages 9-10. In Table 3 we present results for the three specifications as in the previous figures, that is the raw correlation (Panel A, now including lags of the outcome and of life satisfaction), with additional control variables (Panel B) and taking mothers' personality traits into account (Panel C). All indicators of child development display a strong persistence over time, with coefficients of the lagged outcome of 0.35 to 0.51 SD across the indicators in Panel A. Even when the baseline development measures are considered, current maternal life satisfaction indicates a strong positive relationship with child outcomes with coefficients in the same ballpark as those in Table 3, suggesting that this relationship does not simply indicate favourable genetics, as long as the impact of genetics on child outcomes is assumed to be time-constant. Including control variables has only a minor impact on the coefficients, but, in line with the previous results, controlling for mothers' Big 5 mutes the effect of maternal life satisfaction on child development somewhat. We find no evidence for a role of past maternal life satisfaction beyond the direct effect on past child development

### 4.3 Adolescents (11-14 years): Child life satisfaction, school grades, Big 5

In the final step of our analysis, we turn our attention to adolescents aged 11-14 years. At this age, the development indicators are self-reported and not based on responses by their parents. This allows us to alleviate concerns that the positive association between maternal life satisfaction and child outcomes is driven by a systematic bias that more satisfied mothers assess their children's development more generously.

Adolescent's life satisfaction is measured on the same 11-point Likert scale as for mothers. Similarly, Big 5 personality traits of adolescents are based on the same set of questions used for mothers. School grades are measured as is common in Germany from 1 to 6. We again standardise all outcomes and code them such that larger values

**Table 2** SEB and child Big 5—Specifications of maternal life satisfaction (child age: 5-10 years)

	Socio-emotional		Prosocial		Big 5		Neuroticism (7)
	score (1)	behaviour (2)	Openness (3)	Conscien. (4)	Extraversion (5)	Agreeableness (6)	
Life satisfaction <sub>t</sub>	0.057*** (0.007)	0.038*** (0.007)	0.035*** (0.006)	0.037*** (0.006)	0.020*** (0.006)	0.045*** (0.006)	0.024*** (0.006)
N	9132	9130	12,080	12,083	12,071	12,051	12,071
Life satisfaction <sub>t-2,t-1,t</sub>	0.071*** (0.009)	0.053*** (0.009)	0.044*** (0.007)	0.046*** (0.007)	0.022*** (0.007)	0.055*** (0.007)	0.032*** (0.007)
N	9219	9217	12,146	12,149	12,139	12,116	12,137
Life satisfaction <sub>t</sub> (IV sample)	0.090*** (0.018)	0.051*** (0.016)	0.038*** (0.018)	0.079*** (0.018)	0.032* (0.018)	0.072*** (0.019)	0.023 (0.019)
N	1524	1524	1521	1522	1522	1518	1518
Life satisfaction <sub>t</sub> (IV <sub>p-2</sub> )	0.176** (0.072)	0.130* (0.074)	0.181** (0.079)	0.204*** (0.078)	0.137* (0.075)	- 0.002 (0.082)	0.165** (0.080)
F-statistic of first stage	64.165	64.165	62.583	62.572	62.873	62.285	63.244
N	1524	1524	1521	1522	1522	1518	1518

See Table 2 and Fig. 2 for notes. Robust standard errors in parentheses, \* < 10% \*\* < 5% \*\*\* < 1% Source: SOEP v37.

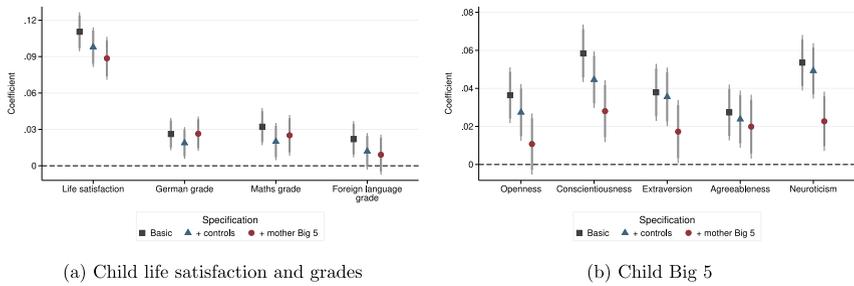
**Table 3** SEB and child Big 5: Value-added model (child age: 5-10 years)

	Socio-emotional		Big 5 (child)				Neuroticism (7)
	score (1)	behaviour (2)	Openness (3)	Conscientiousness (4)	Extraversion (5)	Agreeableness (6)	
<b>Panel A: Basic specification</b>							
Lagged outcome	0.513*** (0.024)	0.353*** (0.025)	0.504*** (0.021)	0.505*** (0.018)	0.499*** (0.018)	0.464*** (0.019)	0.379*** (0.017)
Maternal life satisfaction	0.067*** (0.016)	0.059*** (0.018)	0.037*** (0.013)	0.050*** (0.012)	0.027** (0.012)	0.030** (0.012)	0.027** (0.012)
Lagged mat. life sat.	0.032** (0.015)	- 0.003 (0.016)	0.027** (0.012)	0.012 (0.011)	- 0.005 (0.011)	0.026** (0.012)	0.029** (0.012)
N	2068	2068	3043	3044	3041	3033	3041
<b>Panel B: + Controls</b>							
Lagged outcome	0.491*** (0.025)	0.339*** (0.025)	0.481*** (0.021)	0.487*** (0.018)	0.499*** (0.019)	0.459*** (0.019)	0.377*** (0.017)
Maternal life satisfaction	0.063*** (0.016)	0.062*** (0.017)	0.029** (0.013)	0.044*** (0.012)	0.025** (0.012)	0.030** (0.012)	0.024* (0.013)
Lagged mat. life sat.	0.032** (0.015)	0.001 (0.016)	0.019 (0.012)	0.005 (0.011)	- 0.003 (0.011)	0.028** (0.012)	0.026** (0.012)
N	2068	2068	3043	3044	3041	3033	3041
<b>Panel C: + maternal Big 5</b>							
Lagged outcome	0.459*** (0.025)	0.318*** (0.024)	0.469*** (0.022)	0.468*** (0.019)	0.480*** (0.019)	0.440*** (0.019)	0.347*** (0.017)
Maternal life satisfaction	0.040** (0.016)	0.046*** (0.017)	0.016 (0.014)	0.031** (0.012)	0.014 (0.012)	0.017 (0.012)	- 0.003 (0.013)

Table 3 continued

	Big 5 (child)						
	Socio-emotional score (1)	Prosocial behaviour (2)	Openness (3)	Conscientiousness (4)	Extraversion (5)	Agreeableness (6)	Neuroticism (7)
Lagged mat. life sat.	0.016 (0.015)	- 0.014 (0.017)	0.012 (0.012)	- 0.001 (0.011)	- 0.009 (0.012)	0.018 (0.012)	0.012 (0.012)
N	2036	2036	3010	3011	3008	3000	3008

Tables shows estimates based on a value-added model specified in eq. (3). Sample is restricted to children for whom outcomes are observed twice at different ages, commonly two years apart. Basic specification only includes the variables listed. Control variables as listed in Fig. 2. \* < 10% \*\* < 5% \*\*\* < 1% Source: SOEP v37



**Fig. 5** Coefficients of maternal life satisfaction on children’s life satisfaction, school grades and Big 5 (11–14 years). *Notes:* Life satisfaction ranges from 0–10. School grades are standardised with a higher grade being better. Big 5 scores also standardised. Source: SOEP v37. (a) Child life satisfaction and grades. (b) Child Big 5

indicate better outcomes (otherwise lower school grades in Germany are better with 1 being the best grade).

In adolescence, mothers are on average spending less than one hour per day on child care activities.<sup>18</sup> At younger ages, when children spent a substantial amount of their time with their mothers, a positive influence of maternal life satisfaction on her children’s development may be expected. But at older ages, the influence of schools, friends and other peers becomes increasingly important. However, maternal life satisfaction could still have a positive impact as it could be a decent proxy for a positive and supportive environment at home.

Figure 5 reveals that even at this advanced age, maternal life satisfaction is strongly correlated with child outcomes. Maternal Big 5 only moderates the impact on some child outcomes. The largest coefficient, perhaps not too surprisingly, is for life satisfaction of adolescents which increases by 0.09 SD. But as panel (a) shows, there are also smaller positive effects on academic achievement reflected in better school grades (the effect for foreign language is not statistically significant once control variables are added). Panel (b) shows the association of maternal life satisfaction with self-reported Big 5 of her adolescent children. In our preferred specification with maternal personality traits included, all coefficients are statistically significant and in a range of 0.02 to 0.03 SD. The maternal life satisfaction coefficients for the Big 5 outcomes are smaller than those reported in Fig. 3 for primary school-aged children.<sup>19</sup> This could be due to the fact that maternal influence at the older age is becoming smaller as they are also spending less time with each other. But an alternative possibility is that the outcomes of adolescents are self-reported and therefore potentially less prone to the bias that mothers’ judgement of her children’s personality trait is correlated with her life satisfaction.

As in the estimates for children of primary school age in Fig. 3, the coefficients for neuroticism exhibit the largest move towards zero indicating that for this outcome a

<sup>18</sup> Defined as supervision, help with homework, playing or doing sports with the child, reading to the child or other residual child care activities.

<sup>19</sup> When accounting for multiple hypothesis testing in Appendix Fig. 10, p-values for extraversion and agreeableness indicate that the correlations are not statistically different from zero at conventional levels.

larger part of the effect is moderated through mothers' personality. Estimates by gender of adolescents are—as for the other outcomes—not statistically different from one another (Appendix Fig. 18). Looking at the association with fathers' life satisfaction, we find across all outcomes about similarly sized coefficients as for mothers (Appendix Fig. 19). Thus, compared to Appendix Figs. 12 and 17, it seems that fathers seem to matter more when children are older than when they are younger. This is consistent with research showing that fathers' influence on child development becomes more apparent as children grow and their needs become more complex, such as during school years and adolescence as discussed extensively in Lamb (2004).

An additional set of health and social outcomes is presented in Appendix Fig. 20. We see weak evidence for an overall improvement in self-reported health, a decrease in the BMI and a binary indicator for obesity, and no impact on the number of friends respondents declare to have.

As for the other indicators of child development measured at different ages, we present results for different specifications of maternal life satisfaction in Table 4. The IV estimation is increasingly demanding with older child age, as the availability of a pre-birth measure of maternal life satisfaction requires mothers to have participated in SOEP over a period of 13 years (though not necessarily all years in-between). Due to this, the sample is now reduced by more than 90% and the F-statistic is becoming weak. For transparency these results are included, but due to the small sample size, insufficient values of the F-statistics and bloated standard errors, we are reluctant to put much weight on this estimation for the older age group.

For adolescents all child development indicators are also elicited twice, which again enables us to implement the same value-added specification. The outcomes are measured only two survey years apart compared to four years apart for younger children. Due to the auto-correlational nature of the indicators, this could reduce the influence of contemporaneous maternal life satisfaction to a larger degree. Yet this is not what the estimates in Table 5 show; even in the full specification including mothers' Big 5 the association between their life satisfaction and child development is statistically significant for many outcomes. The coefficient for life satisfaction is again largest with an increase of 0.059 SD in the full specification. Taken together, we find no evidence that the positive association between maternal life satisfaction and their children's outcomes fades out when these are adolescents.

When estimating the same value-added models as for mothers including paternal life satisfaction, we find that coefficients become smaller in size and all significance disappears for child outcomes at ages 5-10, while only the German grade retains its significance at ages 11-14 (available on request). However, we cannot conclude from this that fathers' genes matter more and father's behaviour matters less for child outcomes compared to mothers. The difference in findings between mothers and fathers in these estimations can also be due to a lack of power in the paternal value-added models, as sample sizes are somewhat smaller than those for the maternal value-added models. Still, comparing younger children (5-10) to older children (11-14), the value-added models for fathers indicate again that fathers tend to matter more for their children at older ages.

**Table 4** Life satisfaction, school grades, Big 5: Specifications of maternal satisfaction (child age: 11-14 years)

	Big 5								
	Life satisfaction	German grade	Maths grade	lang. grade	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Life satisfaction <sub>t</sub>	0.153*** (0.016)	0.026*** (0.007)	0.025*** (0.009)	0.009 (0.008)	0.011 (0.008)	0.028*** (0.008)	0.017** (0.008)	0.020** (0.009)	0.023*** (0.008)
N	6068	5663	5667	5550	6050	5964	5900	5973	5952
Life satisfaction <sub>t-2,t-1,t</sub>	0.182*** (0.018)	0.042*** (0.009)	0.043*** (0.010)	0.021** (0.010)	0.022** (0.010)	0.040*** (0.010)	0.023** (0.010)	0.035*** (0.010)	0.028*** (0.010)
N	6182	5768	5772	5654	6164	6073	6009	6085	6064
Life satisfaction <sub>t</sub> (IV sample)	0.252*** (0.060)	0.034 (0.026)	0.014 (0.029)	0.047 (0.032)	0.035 (0.031)	0.067*** (0.030)	0.002 (0.033)	0.034 (0.033)	0.049* (0.028)
N	574	553	553	548	576	564	568	570	568
Life satisfaction <sub>t</sub> (IV <sub>β=2</sub> )Life satisfaction (IV 2)	0.915*** (0.301)	0.176 (0.121)	- 0.040 (0.150)	0.114 (0.144)	0.141 (0.162)	0.270* (0.163)	- 0.217 (0.165)	0.010 (0.161)	- 0.188 (0.154)
F-statistic of first stage	14.421	13.374	12.554	12.256	14.384	15.365	14.751	13.211	15.170
N	574	553	553	548	576	564	568	570	568

See Table 2 and Fig. 2 for notes. Robust standard errors in parentheses, \* < 10% \*\* < 5% \*\*\* < 1% Source: SOEP v37

**Table 5** Life satisfaction, school grades, Big 5: Value-added model (child age: 11-14 years)

	Life					Big 5			
	satisfaction (1)	German grade (2)	Maths grade (3)	lang. grade (4)	Openness (5)	Conscien. (6)	Extraversion (7)	Agreeableness (8)	Neuroticism (9)
Basic specification									
Lagged outcome	0.328*** (0.028)	0.523*** (0.021)	0.495*** (0.023)	0.486*** (0.022)	0.475*** (0.021)	0.478*** (0.021)	0.461*** (0.023)	0.195*** (0.024)	0.419*** (0.022)
Maternal life satisfaction	0.070*** (0.016)	0.030** (0.012)	0.027* (0.015)	0.004 (0.014)	0.017 (0.014)	0.037*** (0.013)	0.047*** (0.015)	0.022 (0.016)	0.029** (0.014)
Lagged mat. life sat.	0.021 (0.016)	0.002 (0.012)	0.025* (0.015)	0.007 (0.014)	0.009 (0.014)	- 0.010 (0.013)	0.002 (0.015)	0.022 (0.016)	- 0.013 (0.014)
N	1937	1765	1768	1724	1920	1878	1850	1885	1871
+ Controls									
Lagged outcome	0.317*** (0.028)	0.485*** (0.022)	0.472*** (0.024)	0.468*** (0.022)	0.449*** (0.021)	0.461*** (0.022)	0.459*** (0.023)	0.192*** (0.024)	0.405*** (0.022)
Maternal life satisfaction	0.067*** (0.016)	0.023* (0.013)	0.017 (0.015)	- 0.002 (0.014)	0.012 (0.014)	0.031** (0.013)	0.047*** (0.015)	0.015 (0.016)	0.037*** (0.014)
Lagged mat. life sat.	0.016 (0.016)	- 0.002 (0.012)	0.017 (0.015)	0.001 (0.014)	0.006 (0.014)	- 0.013 (0.013)	0.001 (0.015)	0.015 (0.016)	- 0.015 (0.014)
N	1937	1765	1768	1724	1920	1878	1850	1885	1871
+ maternal Big 5									
Lagged outcome	0.314*** (0.029)	0.476*** (0.022)	0.461*** (0.024)	0.470*** (0.023)	0.444*** (0.022)	0.458*** (0.022)	0.449*** (0.024)	0.189*** (0.025)	0.396*** (0.022)
Maternal life satisfaction	0.059*** (0.017)	0.024* (0.013)	0.017 (0.016)	- 0.009 (0.015)	0.006 (0.014)	0.026* (0.014)	0.037** (0.015)	0.016 (0.017)	0.021 (0.015)

**Table 5** continued

	Life satisfaction		Foreign lang. grade		Big 5				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged mat. life sat.	0.015 (0.017)	0.000 (0.013)	0.021 (0.016)	0.001 (0.015)	0.011 (0.014)	- 0.019 (0.013)	0.009 (0.016)	0.022 (0.017)	- 0.022 (0.015)
N	1877	1724	1727	1684	1874	1833	1807	1841	1827

Sample is restricted to children for whom outcomes are observed twice and two years apart. Basic specification only includes the variables listed. Control variables as listed in Fig. 2. \* < 10% \*\* < 5% \*\*\* < 1% Source: SOEP v37

## 5 Conclusion

Gary Becker noted in his Nobel lecture that "*Parental attitudes and behavior have an enormous influence on their children*" (Becker, 1992). By now, the importance of parents for their children can seem like conventional wisdom. Cunha & Heckman (2007) argue that this point is largely accepted and often emphasised in the economic literature on child development, but that (both parental and non-parental) investments at different periods of childhood must be distinguished from one another. Investments in early childhood are commonly seen as particularly productive with no equity-efficiency trade-off in contrast to later investments (Cunha et al., 2006; Knudsen, Heckman, Cameron and Shonkoff, 2006). While these influential studies consider different types of parental investments, their logic can arguably be transferred to the focus of our study: maternal life satisfaction. Policies improving maternal life satisfaction can have large returns not only for mothers themselves, but as we argue, also for their children. On average a one-point higher life satisfaction is associated with an increase in children's non-cognitive outcomes similar to a substantial additional 1.6 years of maternal education. Similar results apply for fathers' life satisfaction and child outcomes, with similar sized or smaller and insignificant coefficients for younger children. For older children, fathers seem to matter as much as mothers do.

What makes our findings of a strong association between maternal life satisfaction and numerous indicators of child development remarkable, is that we identify a strong relationship even at older child ages and when controlling for past outcomes arguably capturing a larger part of previous parental investments and past maternal life satisfaction. The results for fathers also remain in some cases after controlling for time-invariant factors, but only in the case of older children. Mothers, on the other hand, remain important for children's development at all ages analysed, and not only at a young age when they are their main caregiver spending many hours with them each day. This is an important result as it might hint at cumulative aspects of maternal life satisfaction in the long run. However, a question remaining for future research is to what extent dynamic genetic effects contribute to the associations uncovered here.

A fruitful avenue for research is thus identifying policies which can improve maternal (and paternal) well-being as this is likely to yield substantial positive spillovers for child development and through this also generate overall societal benefits. And these policies should not only focus on parents of younger children. It is also important to remember that our estimates hold while controlling for factors such as income or employment, so these policies do not necessarily need to directly influence these outcomes and in fact Clark et al. (2018) show that these are in any case poor predictors of well-being. Publicly provided formal childcare, for instance, is a family policy measure which increases maternal well-being (Schmitz, 2020) and could through this also affect children via more satisfied mothers who have more capacity to dedicate high-quality interactions to their children (Chaparro, Sojourner and Wiswall, 2020; Jessen, Spieß and Waights, 2022). Children might not primarily benefit from more time with their parents, but more quality time (Nelson, Kushlev and Lyubomirsky, 2014). This might also be facilitated if parents can rely on other external care takes, such as grandparents, who can help to ease some constraints of parents, which has been show to result in higher satisfaction among parents as well (Barschkett et al., 2025). However, these mechanisms are not related to parents of

younger children only, similar policies and supports are needed for parents of older children: In this case we think of all-day schooling or all-day-care for school children and grandparental care for older grand children. Moreover, labour market policies, such as flexible working hours or employer-related family friendly measures, which may increase the well-being of employed mothers (Lauber & Storck, 2019) having not only younger but also older children, can play an important role as well. The increase in working from home induced by the COVID-19 pandemic may also have long-run effects; effects on promotions of this may be negative, but this is countered by an increase in worker job satisfaction and a substantial amount of time saved due to not commuting which has been dedicated to care-giving among parents (Aksoy et al., 2023). Through their potential effect on the next generation's human capital, such policies impacting maternal life satisfaction can affect the future workforce as well.

**Data availability** The paper uses data from the German Socio-Economic Panel (SOEP). SOEP is a longitudinal panel survey of the German population run by the German Institute for Economic Research (DIW, see Goebel et al., 2019). To use the data, an agreement has to be signed with the DIW. All details on the application and required documents to access the data can be found under the following link: [https://www.diw.de/en/diw\\_01.c.601584.en/data\\_access.html](https://www.diw.de/en/diw_01.c.601584.en/data_access.html)The analysis uses the SOEP-Core v37, covering the years 1984-2020. For research purposes, usage of SOEP is free of charge.

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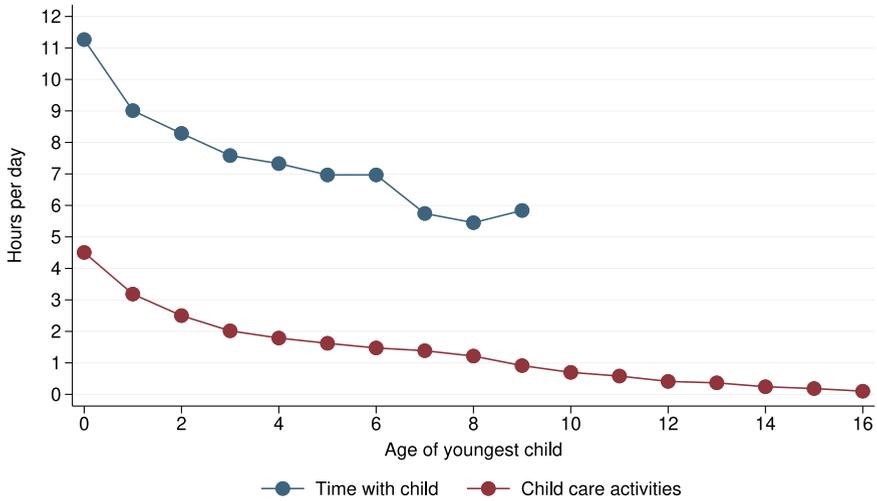
**Compliance with ethical standards**

**Conflict of interest** The authors declare no competing interests.

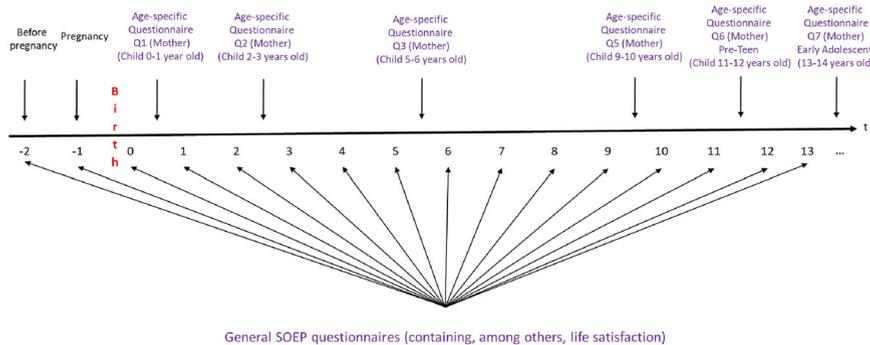
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## 6 APPENDIX

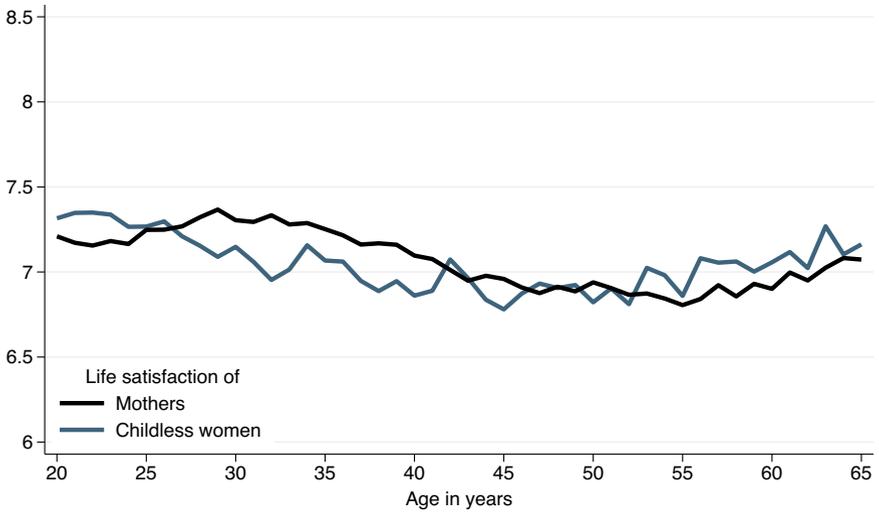
Figs. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, Tables 6, 7, 8, 9



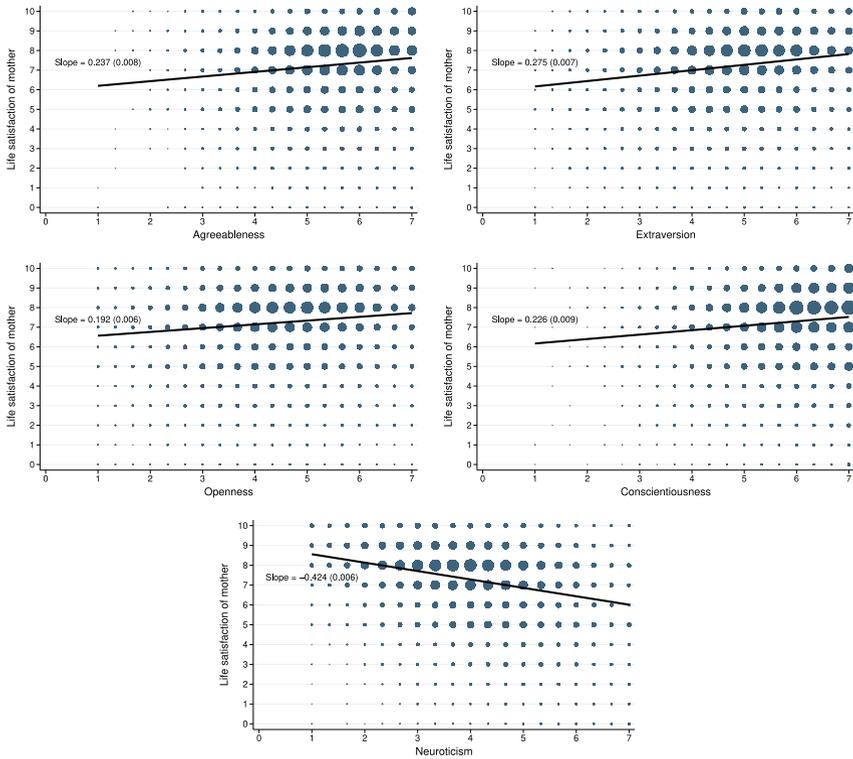
**Fig. 6** Time spent with child and on childcare activities of mothers by age of youngest child. *Notes:* Information on time spent with a child is only available for children up the age of 10. Activities other than child care (e.g. housework or paid work) can be indicated while a child is present. Source: German Time-use Study 2012/13



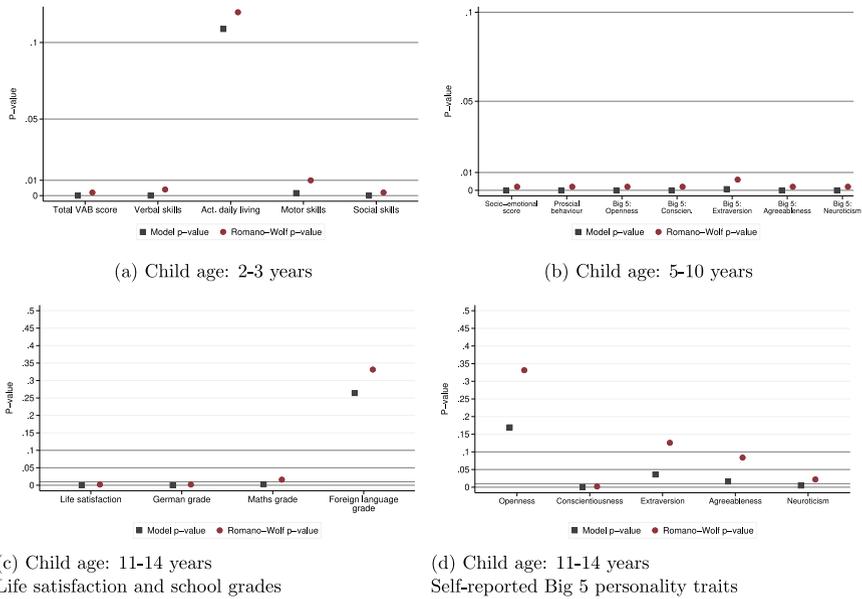
**Fig. 7** SOEP questionnaires. *Notes:* Figures shows the timing of SOEP questionnaires on child outcomes and life satisfaction. Source: Own illustration



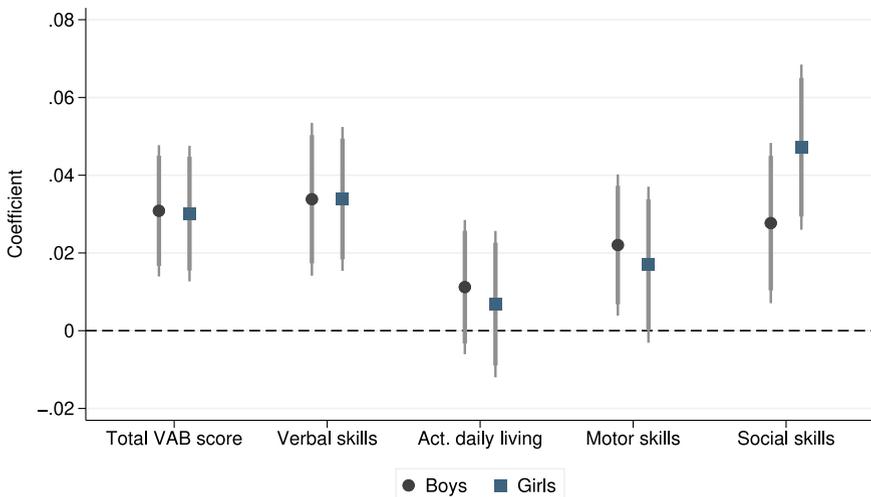
**Fig. 8** Life satisfaction—mothers and childless women. *Notes:* Life satisfaction is coded on a 0-10 Likert scale. “Mothers” indicate that women are having a child at some point observed in the data, and vice versa for “childless women”. Source: SOEP v37



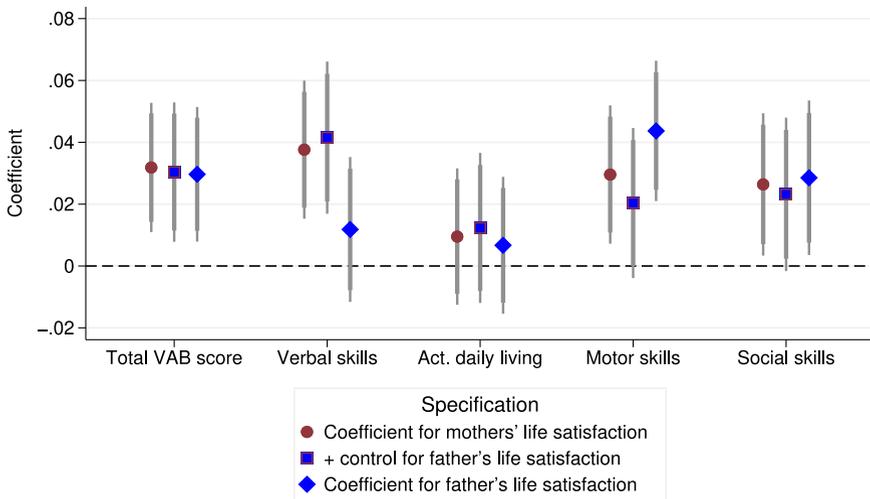
**Fig. 9** Maternal life satisfaction and Big 5 personality traits. *Notes:* Figures show the correlation between maternal life satisfaction and her Big 5 personality traits. Scatters are weighted by the number of observations in each combination. The slope with standard errors in parentheses refer to the linearly fitted line. Source: SOEP v37



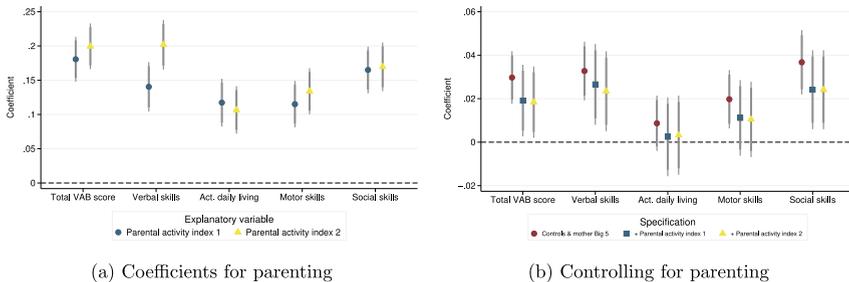
**Fig. 10** Romano-Wolf stepdown p-values for multiple hypothesis testing. *Notes:* The figure compares regular p-values and stepdown p-values adjusted for multiple hypothesis testing following Romano & Wolf (2005) with 500 replications. Adjusted p-values are calculated using the Stata package by Clarke et al. (2020). P-values refer to those of estimates obtained with the full set of controls. Source: SOEP v37. (a) Child age: 2-3 years. (b) Child age: 5-10 years. (c) Child age: 11-14 years Life satisfaction and school grades. (d) Child age: 11-14 years Self-reported Big 5 personality traits



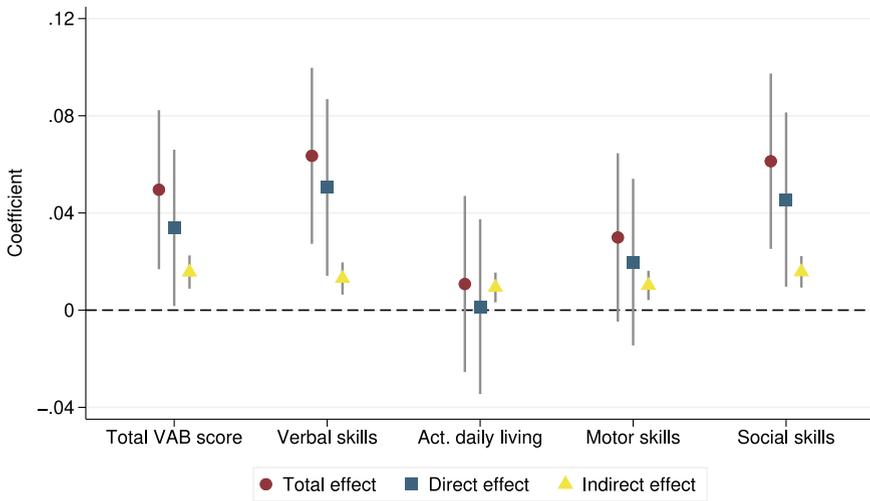
**Fig. 11** VAB scores and maternal life satisfaction by child gender. *Notes:* Figure shows the association between VAB scores and maternal life satisfaction separately by child gender. Estimates are based on the full specification including control variables and maternal Big 5. See Fig. 2 for other notes. Source: SOEP v37



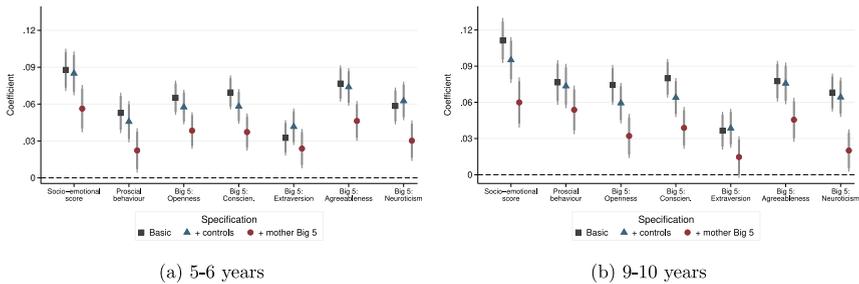
**Fig. 12** VAB scores, maternal and paternal life satisfaction. *Notes:* Figure shows coefficients of contemporaneous maternal and paternal life satisfaction on various indicators on child development obtained from estimating eq. (1). Maroon circles are the same estimates as in Fig. 2 but restricted to observations where information for maternal and paternal life satisfaction is available. Squares stem from estimates where paternal life satisfaction is additionally added as a control variable. Blue diamonds show the coefficients for father’s life satisfaction, which control for father’s Big 5. All child outcomes are standardised. Child age ranges from 15–49 months. Control variables at mother level: age, born in Germany, relationship status (married, partner, no partner / unknown), employment status (full-time, part-time, marginal or unemployed), education and partner’s education (university, vocational or no degree), log household income. Control variable at child level: age, sex, hours in formal childcare (none, 1-20, 21-30, 31+). All estimates include survey year fixed effects. Range plots indicate 90% (thick line) and 95% (thin line) confidence intervals. Source: SOEP v37



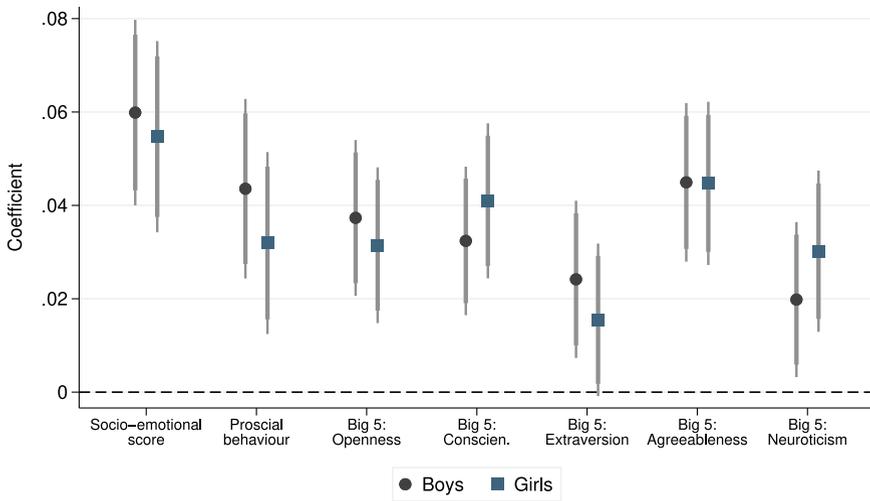
**Fig. 13** VAB scores and parental activities. *Notes:* Parenting index 1 is a composite index of the frequency of 13 parent-child activities. Parenting index 2 consists of singing to and with the child, handicraft work, reading stories, looking at picture books and playing games together. Panel (a) shows coefficients for the parenting indices, Panel (b) shows coefficients for maternal life satisfaction. Source: SOEP v37



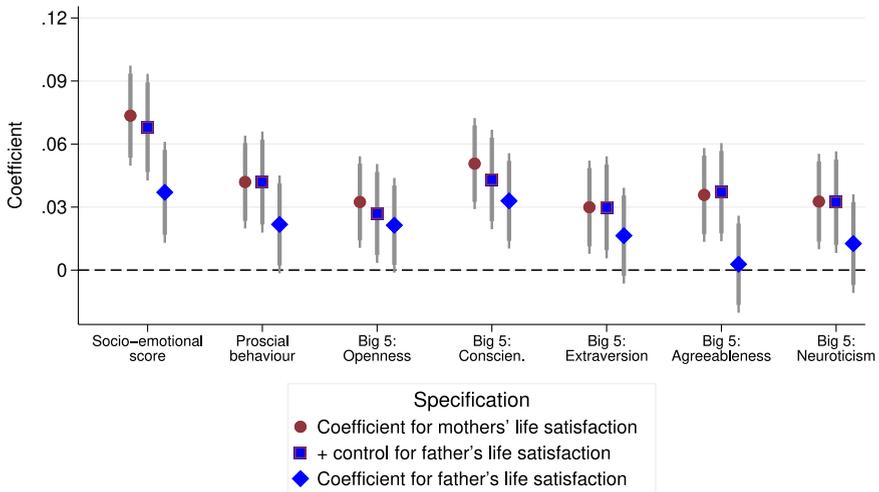
**Fig. 14** VAB scores and parental activities: Mediation analysis. *Notes:* Figure shows a mediation analysis where we examine to what degree the relationship between maternal life satisfaction (evaluated at the 25th and 75th percentile) and toddler’s outcome can be explained by parental investments (parenting index 1 of Appendix Fig. 13). The indirect effect is the part of maternal life satisfaction explained by parental investments and the direct effect is the remaining share of the total effect. Source: SOEP v37



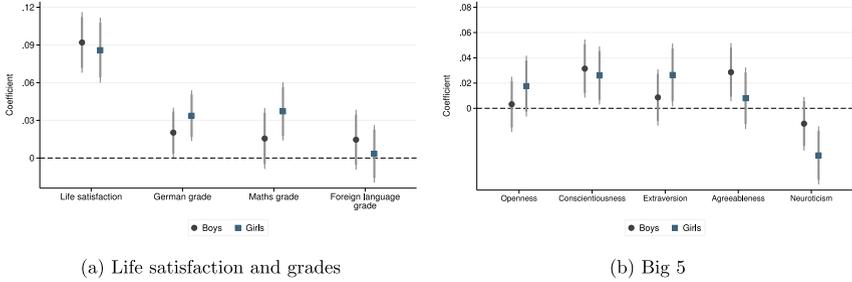
**Fig. 15** SEB scores, child Big 5 and maternal life satisfaction by child age. *Notes:* In Fig. 3 the two child ages at which SEB scores and child Big 5 are measured are pooled. This figure shows estimates separately for the two age bins when the information is collected. Source: SOEP v37. (a) 5-6 years. (b) 9-10 years



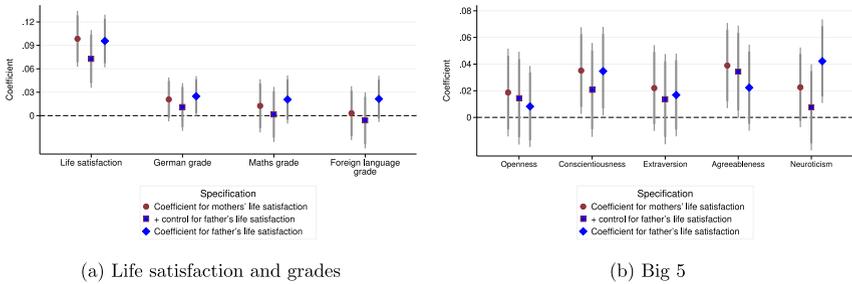
**Fig. 16** SEB scores, child Big 5 and maternal life satisfaction by child gender. *Notes:* Figure shows the association between SEB scores, child Big 5 and maternal life satisfaction separately by child gender. Estimates are based on the full specification including control variables and maternal Big 5. See Fig. 2 for other notes. Source: SOEP v37



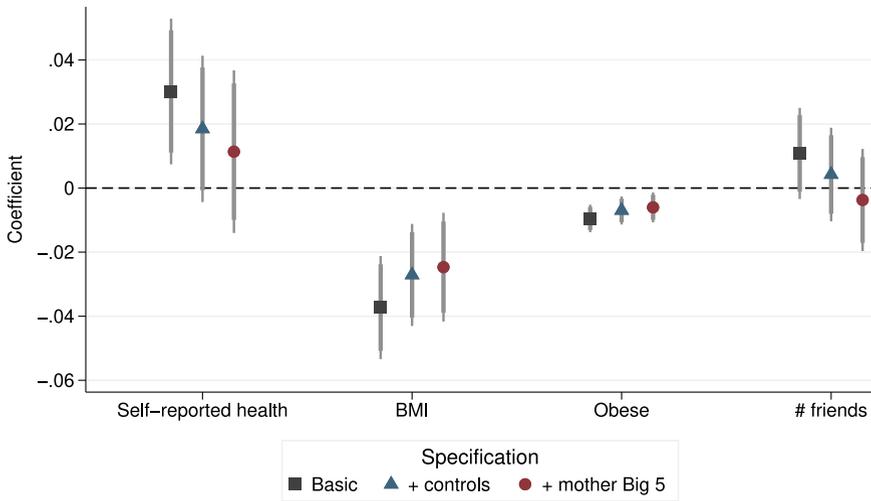
**Fig. 17** SEB scores, child Big 5, and maternal and paternal life satisfaction. *Notes:* Figure shows coefficients of contemporaneous maternal and paternal life satisfaction on various indicators on child development at primary school age. See Appendix Fig. 12 for other notes. Source: SOEP v37



**Fig. 18** Life satisfaction, school grades, Big 5 by child gender. *Notes:* Figure shows the association between adolescents’ life satisfaction, school grades and personality traits with maternal life satisfaction separately by child gender. Estimates are based on the full specification including control variables and maternal Big 5. See Fig. 5 for other notes. Source: SOEP v37. (a) Life satisfaction and grades. (b) Big 5



**Fig. 19** Life satisfaction, school grades, Big 5, and maternal and paternal life satisfaction. *Notes:* Figure shows coefficients of contemporaneous maternal and paternal life satisfaction on various indicators on various outcomes of adolescents. See Appendix Fig. 12 for other notes. Source: SOEP v37. (a) Life satisfaction and grades. (b) Big 5



**Fig. 20** Adolescents—health outcomes and friends. *Notes:* Obesity is coded as a binary indicator equal to one if the body mass index exceeds 25 which at this age is counted as obese by the CDC, see [https://www.cdc.gov/healthyweight/assessing/bmi/childrens\\_bmi/about\\_childrens\\_bmi.html](https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html)

**Table 6** Correlation coefficients between maternal and child big 5 personality traits at child age 5-10

	<i>Mother Big 5</i>				
	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
<i>Child Big 5</i>					
Openness	0.124	0.094	0.082	0.066	- 0.097
Conscientiousness	0.086	0.144	0.039	0.117	- 0.119
Extraversion	0.065	0.090	0.166	0.028	- 0.051
Agreeableness	0.095	0.119	0.068	0.158	- 0.142
Neuroticism	- 0.092	- 0.109	- 0.139	- 0.076	0.181

Table shows the correlation coefficients between maternal and child personality traits as measured by the Big 5. The child age in this table ranges from 5 to 10 years. Source: SOEP v37

**Table 7** Correlation coefficients between maternal and child big 5 personality traits / life satisfaction at child age 11 to 14

		<i>Mother Big 5</i>					
		Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	Life satisfaction
<i>Child Big 5 / life satisfaction</i>							
Openness		0.183	0.071	0.068	0.077	- 0.023	0.062
Conscientiousness		0.081	0.160	0.014	0.163	- 0.041	0.100
Extraversion		0.095	0.079	0.153	0.069	- 0.072	0.064
Agreeableness		0.021	0.022	0.035	0.039	- 0.007	0.046
Neuroticism		- 0.067	- 0.072	- 0.043	- 0.080	0.158	- 0.091
Life satisfaction		0.017	0.105	0.056	0.083	- 0.063	0.188

Table shows the correlation coefficients between maternal and child personality traits as measured by the Big 5 as well as their life satisfaction. Children's outcome in this sample are self-reported. The child age in this table ranges from 11 to 14 years. Source: SOEP v37

**Table 8** Summary statistics of main estimation samples and IV samples

Age of child:	2-3 years		5-10 years		11-14 years	
	VAB scores		SEB scores / Big 5		Life satisf. / grades / Big 5	
Outcomes:						
	Main	IV	Main	IV	Main	IV
Sample	(1)	(2)	(3)	(4)	(5)	(6)
Age of mother	33.99 (5.55)	33.46 (5.07)	38.56 (6.01)	37.77 (5.29)	41.38 (7.32)	42.81 (4.95)
Born in Germany	0.76 (0.42)	0.88 (0.33)	0.72 (0.45)	0.91 (0.28)	0.79 (0.41)	0.97 (0.16)
Married	0.76 (0.42)	0.77 (0.42)	0.76 (0.43)	0.79 (0.41)	0.68 (0.46)	0.80 (0.40)
Full-time employed	0.11 (0.31)	0.13 (0.33)	0.15 (0.36)	0.18 (0.39)	0.22 (0.42)	0.29 (0.45)
Part-time employed	0.28 (0.45)	0.35 (0.48)	0.40 (0.49)	0.49 (0.50)	0.46 (0.50)	0.59 (0.49)
University degree	0.25 (0.43)	0.32 (0.47)	0.25 (0.43)	0.30 (0.46)	0.21 (0.41)	0.31 (0.46)
Vocational degree	0.52 (0.50)	0.55 (0.50)	0.51 (0.50)	0.60 (0.49)	0.56 (0.50)	0.64 (0.48)
Ln household income	7.60 (1.64)	7.59 (1.73)	7.70 (1.71)	7.71 (1.77)	7.73 (1.83)	8.00 (1.71)
Child age in years	2.72 (0.48)	2.74 (0.32)	7.85 (2.04)	7.09 (1.92)	12.67 (1.05)	12.58 (1.04)
Child is a girl	0.49 (0.50)	0.49 (0.50)	0.49 (0.50)	0.51 (0.50)	0.49 (0.50)	0.51 (0.50)
Observations	8112	1554	9132	1524	6033	568

The table reports descriptive statistics for the main estimation samples and the IV samples, where maternal life satisfaction is instrumented with her life satisfaction two years before her first birth. All characteristics except of the last two refer to mothers. Columns (1)-(2) correspond to Table 1, columns (3)-(4) to Table 2 and columns (5)-(6) to Table 4. Source: SOEP v37

**Table 9** First-stage regressions

Dependent variable:	Contemporaneous maternal life satisfaction					
	(1)	(2)	(3)	(4)	(5)	(6)
Life satisfaction two years before first birth	0.336*** (0.026)	0.259*** (0.026)	0.300*** (0.029)	0.220*** (0.027)	0.227*** (0.049)	0.173*** (0.046)
Sample: IV estimates in	Table 1		Table 2		Table 4	
Control variables	–	Y	–	Y	–	Y
N	1554	1554	1524	1524	574	574

Table presents the first-stage regressions for the IV regressions reported in the last columns of Tables 1, 2 and 4. Uneven columns show the raw correlation, even numbers include control variables including maternal Big 5, on which the estimates in the respective tables are based on. Robust standard errors in parentheses, \*\*\* < 1% Source: SOEP v37

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