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Parenthood and life satisfaction

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Abstract

This paper examines the relationship between parenthood and life satisfaction using longitudinal data on women from the German Socio-Economic Panel. Previous studies have focused on satisfaction differences between parents and comparable childless adults, mostly finding small and often negative effects of parenthood. These comparisons of *ex-post* similar individuals are problematic if a self-selection into motherhood exists. In this study we examine the selection issue in detail by exploiting the extended longitudinal dimension of the panel to track self-reported life satisfaction of women eventually to become mothers and of women eventually attaining a completed fertility of zero. We document that these groups' satisfaction paths diverge around five years before mothers' first birth, even after adjusting for differences in observables. In our estimations, we employ matching and regression techniques which account for this selection into motherhood. We find motherhood to be associated with substantial positive satisfaction gains.

Keywords: Happiness, subjective well-being, children, fertility, motherhood, parenthood, life cycle, selection, matching, fixed effects.
JEL classification: D10, J11, J12, J13.

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1 Introduction

How does becoming a mother affect women's life cycle utility streams? Rational choice approaches to fertility embedded in standard dynamic economic models of fertility assume that the net utility gain of motherhood is positive. In sharp contrast, the predominant view in the sociological and psychological literature is that there is a negative net effect of parenthood. This view is derived from the empirical literature on subjective well-being where the correlation between having children and life satisfaction is usually found to be negative.

In the previous literature, the implicit control group for parents is represented by childless individuals with the same covariates. This empirical strategy is problematic if parents differ from non-parents in terms of unobserved qualities. One preeminent possible source for such differences in the context of parenthood is self-selection. We show that selection on observable and unobservable characteristics into parenthood is indeed important: prospective mothers' satisfaction increases around five years before first delivery. This suggests the use of exogenous variation in fertility choices to estimate the gains in life satisfaction derived from becoming a parent. Exogenous variations which have been shown to impact fertility decisions include job displacements (Del Bono et al., 2012) or the homogeneity of the first two children's sex (Angrist and Evans, 1998), for instance. However, while such variation is unlikely to be correlated with a number of outcomes of interest, it seems difficult to argue that it does not affect mothers' life satisfaction. Thus, to answer the question of how individual well-being is affected by parenthood alternative empirical strategies need to be explored. The key contribution of this paper is to propose regression models which —exploiting either intra- or interpersonal variation– embed differences in unobserved characteristics that are likely to increase the likelihood of motherhood. In our preferred specification, for instance, we match prospective mothers to women who will never have children but who are similar to prospective mothers in terms of

past life satisfaction paths and observable characteristics. Our results suggest that motherhood is associated with a substantial net utility gain, a finding consistent with rational choice approaches to fertility.

Broadly, this paper contributes to the strand of the literature on the economics of happiness which aims at providing (rough) estimates of trade-offs guiding choice behavior.[1] The last decade has seen a boom in the field of happiness economics with a diverse host of both theoretical and empirical contributions.[2] One reason for this growth has been the increasing evidence from economists and psychologists alike suggesting that individual responses on subjective well-being collected from surveys can be usefully interpreted as proxy measures for utility in a variety of contexts.[3] While the issue studied most intensely has been the relationship of income and employment to well-being, other aspects such as health, marriage and religion have also received due attention in the literature. In each of these cases, the existing research has been able to uncover clear satisfaction gains associated with these factors as would be expected from a mainstream view of utility.[4]

Fertility, by contrast, is an aspect which has received less direct attention in the happiness literature, at least relative to its important place in microeconomic theory and extensive body of accompanying empirical research dating back to Becker

[1]Following the convention in economics, we use the words happiness, satisfaction and well-being as synonyms.

[2]See Ferrer-i-Carbonell (2012), Blanchflower (2008) Layard (2005), Frey and Stutzer (2002) and Kahneman, Diener and Schwarz (1999) for surveys of this literature.

[3]An in-depth review on the literature linking subjective well-being to utility can be found in Clark, Frijters and Shields (2008). See Benjamin et al. (2012) for a recent contribution.

[4]The seminal paper in the literature on income and happiness is Easterlin (1973); see Easterlin (2001) and Stevenson and Wolfers (2008) for recent additions. For sources on the literature on unemployment we refer to Clark and Oswald (1994) and Winkelmann and Winkelmann (1997). For contributions on the relationship between happiness and marriage, and happiness and health, see e.g. Stutzer and Frey (2006) and Veenhoven (2008), respectively.

(1960) and Willis (1973). The predominant finding across numerous datasets is that individuals with children report on average lower satisfaction than comparable childless adults. This negative correlation has found ample resonance in some strands of the sociological and psychological literature, where the result is usually interpreted as a negative net effect of parenthood. Two main rationalizations have been put forward to explain why most adults select into parenthood despite costs apparently outweighing benefits. The first explanation, common in the sociological literature, emphasizes the presence of pro-natal social norms which sanction disconformity (Morgan and Berkowitz King, 2001; Vanassche, Swicegood and Matthijs, 2012). The second, psychological explanation sees the choice for having children as an instance of biased affective forecasting, i.e. individuals making rational decisions based on incorrect expectations (Gilbert, 2006) – in this case, based on the widespread belief expressed in surveys that having children brings happiness (Hansen, 2011). Among economists, on the other hand, the finding has been treated with more reservation, and few attempts at rationalizing it have been undertaken.[5] However, the negative correlation is acknowledged regularly in survey articles in the economic literature (Blanchflower, 2008; Clark, Frijters and Shields, 2008; Dolan, Peasgood and White, 2008; Ferrer-i-Carbonell, 2012), and incidental interpretations along the lines of the psychological and sociological research are not uncommon.

Much of what is known on the subject does not stem from studies focusing on fertility; rather it often comes from regression studies where fertility measures are used as controlling variables to avoid confounding a specific effect of interest (Di Tella, MacCulloch and Oswald, 2003a, 2003b, Alesina, Di Tella and MacCulloch, 2004, Clark, 2007). Three frameworks have been used to study the effect of par-

[5]The small strand of the economic happiness literature focusing on life event studies is an exception in this respect (Clark et al., 2008, Frijters, Johnston and Shields, 2011). These papers, too, find little evidence for a parenthood effect, but they explain their result with adaptation, a concept derived from set point theory. We discuss these findings in more detail below.

enthood on life satisfaction: (i) cross-section and pooled panel regression models, (ii) panel models with fixed effects and (iii) event studies. By far the most common of these is the first framework. Recently, Stanca (2012) confirmed the presence of the negative parenthood effect using this standard happiness equation framework for over 90 countries. Herbst and Ifcher (2012) closely scrutinize the negative effect obtained with this framework for US data, concluding that the magnitude of the effect has been decreasing in the last decades and that it is driven mainly by older parents. The negative effect has also been found using the second framework (e.g. Stutzer and Frey, 2006). In the few instances where the association is found to be positive, it is usually small and insignificant (Clark and Oswald, 2002).[6] The third approach is life-event studies tracking parental satisfaction over a time window around the birth of a child (Clark et al., 2008, Frijters, Johnston and Shields, 2011). This research has concluded that parents adapt completely to the birth of a child after a brief time; i.e. heightened happiness levels return to a previous baseline level, sometimes even dipping below the baseline.

The estimation approaches (i), (ii) and (iii) used by the previous literature are inadequate to measure utility gains from parenthood. A first concern relates to the insight from standard dynamic economic models of fertility which suggest that other outcome variables such as income, partnership status and employment are endogenous to the fertility decision.[7] An implication hereof is that the ceteris-paribus effects reported in the previous literature are difficult to interpret. These effects

[6] One of the few studies reporting a significant positive association is Kohler, Behrman and Skytthe (2005) who study identical twins.

[7] Arroyo and Zhang (1997) provide an overview of the early dynamic fertility model literature; for an example of contemporary research encompassing occupational choice, marriage and fertility, see Ma (2010). Recent studies focusing explicitly on motherhood are surveyed in Del Boca and Locatelli (2006), see also Wilde, Batchelder and Ellwood (2010) and Michaud and Tatsiramos (2011).

represent an ex-post comparison of satisfaction between parents and individuals with no children at the same values of other outcomes, when optimally these outcomes will differ precisely as a consequence of the parenthood decision.[8] Indeed, Herbst and Ifcher (2012), who extensively assess the robustness of the traditional happiness-equation estimates of the parenthood effect, find that the estimates are quite sensitive to the inclusion of different sets of covariates, a typical result when conditioning on mediator variables which are part of the channels through which the effect runs.

The second important concern relates to the selection into motherhood. In approach (i), most of the individuals observed without children are on their way of becoming parents. The self-selection we identify in our analysis implies that using such prospective parents' satisfaction as a counterfactual outcome for parenthood is misleading. In this standard approach, prospective parents are censored and their outcomes attributed to non-parents, and therefore the average satisfaction level of childless adults is overestimated. Moreover, the dynamics of self-selection we find also affect approaches (ii) and (iii). In these approaches the effect of parenthood is identified by comparing pre- and post-birth satisfaction levels of mothers. Given the heightened pre-birth happiness of mothers during the five years foregoing first birth, individual fixed effects are biased upwards and induce a negative bias in the effect of interest. In life event studies this distortion is amplified because such studies usually use a window of only two or four years around the event "birth of a child."

A careful study into the effect of motherhood on satisfaction needs to account for these methodological issues, and we propose estimation strategies which do so. First, we construct a completed fertility decision sample consisting of women whose completed fertility is observed. This ensures the correct classification of women

[8]Figure A in the Appendix illustrates this point by plotting working hours over the life cycle for women remaining childless and mothers with age at first birth 28.

which are about to become mothers (to whom we simply refer to as mothers henceforth) and of women which are never to have children (to whom we refer to as non-mothers). Second, we establish comparability on observable characteristics, such as income, partnership status, etc., between mothers and non-mothers *before* mothers first gave birth to a child. Third, and most important, we account for the five-year-long increase in mothers' life satisfaction that precedes birth of the first child with two different identification strategies. On one hand, we construct a suitable control group for mothers from comparable non-mothers who experienced a satisfaction path similar to that of mothers before first birth. On the other hand, we compare mothers' life satisfaction after birth to their own life satisfaction levels before the onset of the five-year selection period.

For both these approaches we estimate the effect of motherhood for every year from first pregnancy to twenty years after transition to motherhood. We find the satisfaction gain of mothers to be positive throughout. The results are robust and similar for the various estimation strategies we propose, including nearest-neighbor matching and regressions with and without fixed effects, confirming the importance to account for self-selection into motherhood. Large effects occur in the first years after transition to motherhood and are followed by a stabilization at a moderate level. We use the estimates to obtain a monetized net present worth of motherhood, finding the compensating variation of motherhood to lie roughly between one and two net yearly household incomes, depending on the estimates and discount rates used.

This paper is organized as follows. In section 2 we investigate selection into motherhood. Our methodological approaches tackling selection into motherhood are explained in section 3. Section 4 contains our main regression results, and compares them to results obtained using traditional approaches. In section 5 we explore further aspects related to fertility and life satisfaction, such as the effects at

different ages of first birth, the effect for single-child and multiple-parity mothers, and the effect among fathers. Section 6 contains a concluding discussion.

2 Self-selection into motherhood

We use data on women from the German Socio-Economic Panel (GSOEP). The extended time dimension of the panel (twenty-five years in total) allows us to observe long periods of women's lives. In particular, we are able to identify women which later end up with a completed fertility of zero and study their satisfaction including the period of fertile years. The dashed line in Figure 1 presents the average satisfaction path of such non-mothers. Life satisfaction decreases until about the age of 55, and increases afterwards.[9] The solid line plots satisfaction of mothers delivering their first child at age 28. While satisfaction paths are similar after the age of 40, mothers' life satisfaction shows a pronounced peak around the year of first child's birth. Such an evolution of the satisfaction path is quite typical for mothers. The peak would be blurred, however, if the average satisfaction path for mothers with different ages at first birth was plotted.

— — — Figure 1 about here — — —

Mothers' satisfaction path in Figure 1 is also clearly above non-mothers' path before and after transition into motherhood. While in this raw contrast the positive difference after first birth hints at possible satisfaction gains of motherhood, the pre-birth differences suggest that a more rigorous analysis of self-selection of mothers is needed.

We examine differences in pre-birth life satisfaction to study whether there is positive or negative selection on unobservable qualities conditional on observable

[9]Such U-shapes of satisfaction-age curves are common in the literature, cf. Van Landeghem (2012) and Wunder et al. (2011) for recent overviews.

characteristics. Again, we focus on women with observed completed fertility. Fertility is defined as completed by age 41. In our data, 99.8 percent of all mothers had given birth by that age. To identify the evolution before first birth precisely, we use information on the month of first child's birth and the months in which prospective mothers were surveyed in the years prior to first birth. This allows us to compute time to first birth in months. Details on the data are given in Appendix A2.

We regress self-reported life satisfaction on indicators of number of months to first birth and control variables:

$$ls_{it} = \alpha + \mathbf{months\ to\ birth}'_{it}\beta + \mathbf{age}'_{it}\gamma + \mathbf{x}'_{it}\delta + \varepsilon_{it}, \tag{1}$$

where ls_{it} is life satisfaction for individual i in wave t on a 11-point Likert scale. The vector $\mathbf{months\ to\ birth}_{it}$ consists of dummy variables, one for each month before first birth. An element takes the value one if a mother was surveyed during that specific month before birth of her first kid. All elements of $\mathbf{months\ to\ birth}_{it}$ are equal to 0 for non-mothers. The regression controls for age with a full set of dummy variables $\mathbf{age}_{it}$. Accounting flexibly for age is indispensable in the context of fertility. The vector $\mathbf{x}_{it}$ includes further control variables.[10] The variable ε_{it} is the regression error.

— — — Figure 2 about here — — —

Figure 2 visualizes the estimates of the parameters of interest in model (1) for the last seven years before first birth. The solid line shows average predicted life satisfaction for mothers. The dashed and dotted lines depict predicted life satisfaction for non-mothers using the covariate distribution of mothers. The regressions represented by the dashed and dotted lines differ by the number of included control

[10]The further control variables are: survey year, number of years in panel, education, relationship status, household members, working hours and household income. Appendix A0 contains a detailed description of the included terms.

variables. Whereas the former only controls for survey year and years in panel, the regression of the dotted line also controls for the full set of socioeconomic controls. There is little difference between mothers' and non-mothers' life satisfaction until five years before birth. From that point on mothers' satisfaction increases steadily. The growth of the satisfaction path steepens around one year before birth. Women surveyed in the month before birth of their first child report on average a one point higher life satisfaction than comparable non-mothers.[11]

The gradual increase in mothers' satisfaction could be the result of positive life events which are conducive to the decision to start a family (marriage, increased household income, etc.). However, the socioeconomic variables in $\mathbf{x}_{it}$ explain surprisingly little of the gap before first birth, as the dotted line shows. This indicates the presence of substantial positive selection on unobservables. If mothers' life satisfaction decreased after transition, this self-selection would lead standard regression approaches to underestimate the effect of motherhood.

Table 1 contains regression results which confirm the stylized facts visible from Figure 4. The estimates correspond again to model (1), but the large number of monthly indicators has been collapsed into three periods: pregnancy, from pregnancy to five years before first birth, and before five years.[12] Mothers and non-mothers start out having virtually the same expected happiness. Some difference is visible in the years before birth. Pregnancy is characterized by large satisfaction gains.[13]

— — — Table 1 about here — — —

To investigate selection further, we use information on planned and unplanned pregnancies which is available for a subsample of the GSOEP, and replicate Figure

[11]The lines plotted in Figure 4 have been smoothed, which makes the effect appear smaller.

[12]The last period goes beyond the limit of seven years shown in Figure 4. The earliest observations are up to 20 years before first birth. However, the number of observations diminishes very fast with increasing time to first birth.

[13]We also replicated these estimations using yearly birth data and obtained very similar results.

2.[14] The vector containing months to first birth is interacted with an indicator whether the pregnancy was planned or not. Figure 3 plots the results. Mothers with planned pregnancies – the large majority – exhibit the same increasing trend as before. Mothers with unplanned pregnancies have lower average satisfaction. The path is also more volatile, but this might be a consequence of the small sample size. Up to the pregnancy period, there is little evidence for a trend in their satisfaction. However, the evolution during pregnancy mirrors that of planned motherhoods.

Since the pregnancy effect is present in unplanned motherhoods and similar to that of planned motherhoods, we will treat this "anticipation" as part of the satisfaction gains due to motherhood. In contrast, we view the satisfaction differences in the period five years before first birth up to pregnancy as the result of positive selection on unobservables which we seek to account for directly in our estimations.

— — — Figure 3 about here — — —

3 Empirical strategy

We propose three different empirical approaches that embed the increase in life satisfaction during the five years prior to first birth. The first two approaches contrast the life satisfaction trajectory of prospective mothers from pregnancy on with the trajectory of a comparable non-mother. These empirical strategies are (i) a nearest neighbor matching estimator that pairs mothers to the most similar non-mothers in terms of pre-birth covariates and pre-birth life satisfaction, and (ii) a regression which controls for pre-birth covariates and the average pre-birth life satisfaction trend and level. Intuitively, both approaches identify the effect of motherhood by comparing future life satisfaction of similar women who experience the same evo-

[14] The women in this subsample are from younger cohorts. For further details refer to Appendix A3.

lution of happiness, but only some of these women become mothers. The third approach does not rely on a comparison between mothers and non-mothers, but exploits intrapersonal variation. A fixed effect regression with dummy variables for the last five pre-birth years is proposed. This strategy estimates the effect of motherhood on life satisfaction by contrasting mothers' life satisfaction after birth to levels reported prior to the five year long satisfaction increase. Whereas all three regression models differ, all of them preclude self-selection of mothers to affect the estimation of the motherhood effect. The yearly effects can be estimated for the pregnancy period and the first twenty years following birth. While the analysis is restricted to this window owing to the requirement to observe mothers five years before first birth, Figure 1 suggested that satisfaction paths of mothers and non-mothers converge in later years anyhow.

3.1 Nearest neighbor matching

We employ the nearest-neighbor matching estimator with bias correction proposed by Abadie and Imbens (2002; see also Abadie et al., 2004). We match mothers and non-mothers based on age at first birth, values of socioeconomic covariates in the year before birth, and life satisfaction during five, four, three and two years before birth.[15] For instance, consider a hypothetical exact match: A mother with age at first birth 25 is matched to a 25 year old non-mother; both had the same socioeconomic variables at age 24, and both have had the same life satisfaction trajectory from age 20 to 23. Non-mothers can be used to match various ages of first birth. In the previous example, the same non-mother at age 26 can serve as a match to a mother with age at first birth 26. In that case, non-mother's covariates

[15]We use the same socioeconomic variables as before: relationship status, working hours, education, household members, household income. In addition we match on survey wave and years in panel.

are measured at age 25 and past life satisfaction is measured from age 21 to 24. In practice, there are no exact matches over the whole set of conditioning variables, and we match exactly on past life satisfaction paths while using the four nearest matches in terms of Mahalanobi distance for the remaining variables.[16]

For every age of the first born child $p = -1, 0, 1, 2, \ldots 20$, the matching estimator of the motherhood satisfaction effect reads:

$$\beta_p = \frac{1}{N_p} \sum_{i=1}^{N_p} ls_{ip} - \widehat{ls}_{ip}. \tag{2}$$

The variable $\widehat{ls}_{ip}$ denotes mother ip's predicted life satisfaction if she would not have a child. It equals $\frac{1}{4} \sum_{j \in J_i}^{4} ls_{jp}$, where J_i is the set of the four most similar individuals to mother i from the group of non-mothers. N_p is the number of mothers observed p years after first delivery. Thus, the effect (2) can be interpreted as the average treatment effect on the treated for the "treatment" motherhood.

3.2 Regression using past satisfaction levels and trends

Similar in spirit to the matching estimator, this regression contrasts mothers and non-mothers conditioning on pre-birth satisfaction levels and trends. As before, non-mothers were assigned to all possible ages of first birth in order to determine "pre-birth" realizations of their covariates and "post-birth" satisfaction. The regression equation is

$$ls_{it} = \alpha + m_i \cdot \mathbf{yab}'_{it}\beta + \mathbf{yab}'_{it}\gamma + \theta_1 avg(pls)_i + \theta_2 tr(pls)_i + \mathbf{x}'_{it}\delta + \varepsilon_{it}. \tag{3}$$

The variable m_i is an indicator that equals one for mothers and zero for non-mothers. The vector $\mathbf{yab}_{it}$ contains a set of dummy variables for "years after first birth"

[16] Details on the dataset are discussed in Appendix A4. Mahalanobi distance is the Euclidean distance between all matching variables weighted by their inverse covariance matrix (cf. Abadie and Imbens, 2002). Our results are robust to the use of other number of nearest neighbors, such as the single nearest, two and six nearest neighbors.

ranging from -1 to 20. The motherhood variable m_i is interacted with $\mathbf{yab}_{it}$. Thus, mothers' satisfaction path relative to non-mothers during pregnancy and the next twenty years is captured by β. The variables $avg(pls)_i$ and $tr(pls)_i$ control for pre-birth differences in satisfaction two to five years before birth; $avg(pls)_i$ is the average part life satisfaction level and $tr(pls)_i$ –tr stands for trend– is the average yearly change in satisfaction. The vector $\mathbf{x}_{it}$ contains all socioeconomic covariates one year before birth as well as survey year and number of interviews.[17]

Such an analysis places heavy demands on the data. At least four observations per woman need to be available to be included in the estimation sample; mothers must be surveyed before and after giving birth to their first child.[18]

3.3 Fixed effect regression accounting for the anticipation effect

In contrast to the first two estimation strategies the fixed effects regression exploits intrapersonal variation only to identify the effect of motherhood. Hence, this approach does not rely on a contrast between two non-randomly selected groups from the population and controls for time-invariant individual-specific unobserved heterogeneity, such as personality traits. We implement the following specification:

$$ls_{it} = \alpha_i + \mathbf{afc}'_{it}\beta + \mathbf{age}'_{it}\gamma + \mathbf{pre}'_{it}\theta + \mathbf{x}'_{it}\delta + \varepsilon_{it} \tag{4}$$

The vector $\mathbf{afc}_{it}$ contains a set of dummy variables for "age of first child" ranging from -1 to 20. All elements of $\mathbf{afc}_{it}$ are zero for non-mothers; i.e. non-mothers contribute to the identification of the parameters of other covariates only. The

[17] Robustness checks were performed lagging covariates three and five years, producing virtually no changes in the results.

[18] The resulting dataset is described in Appendix A5. Replacing average level and average trend with satisfaction lags as in the matching approach reduces the estimation sample further. Our results are robust to such a specification, too.

model is similar to the regression with past satisfaction level and trend. However, pre-birth covariates and controls for pre-birth satisfaction paths are missing because parameters of time invariant variables are not identified anymore (reducing $\mathbf{x}_{it}$ to controls for survey year and years in panel). They are absorbed into the fixed effects α_i. In order to account for the heightened levels of satisfaction during the five years preceeding birth, i.e. to avoid overestimation of individual fixed effects, a set of four dummy variables is included in the regression ($\mathbf{pre}_{it}$), indicating each of mothers' four years of the anticipation period before pregnancy.[19]

Out of the three regression models, the fixed effect regression is the least demanding on data. All observations, no matter how long in the sample and whether observed before or after birth can be used to identify at least part of the motherhood effect's dynamics, resulting in a visibly increased sample size.[20]

4 Results

4.1 Main results

Figure 6 shows the estimated effects of motherhood for the year before birth of the first child and for the following twenty years. The figure presents results for the three approaches discussed in section 3. The solid line depicts the results of the fixed effects estimation. The dashed and the dotted line, show the results of the regression with past satisfaction level and trend, and the results of the matching approach. An effect in the order of one third point, for example, five years after first child's birth, describes an average life satisfaction difference between mothers and non-mothers of 0.3 points on the 11-point scale. The point estimates used to produce the graph, the corresponding standard errors, and more details on the regressions

[19]For non-mothers, all elements of $\mathbf{pre}_{it}$ are equal to zero.

[20]The data is detailed in Appendix A6.

can be found in Table B (Appendix B).

— — — Figure 6 about here — — —

All three strategies lead to strikingly similar results, especially in the first years after delivery. The figure shows that prospective mothers are happier compared to non-mothers one year before childbirth. The maximum life satisfaction difference between mothers and non-mothers is reached in the year of delivery. The effect is then over half a satisfaction point. The point estimates lie between 0.52 and 0.56 (see Table B). This is a substantial effect compared to the influence of other standard variables in happiness regressions like income or age. The difference in life satisfaction between mothers and non-mothers diminishes with age of the first born child, a sign of adaptation. However, the effect remains positive over the first twenty years of motherhood. The hypothesis that motherhood has no effect on life satisfaction, thus that all shown coefficients are equal to zero, is clearly rejected by an F-test (see Table B). However, even in the fixed effects regression, which gives the most precise estimates, only the coefficients capturing the effects during the year of birth and one year before and after birth are individually significant at the 5% level. The imprecise estimates, evoked by the small number of women who are observed before and some time after childbirth, are also the most likely explanation why the point estimates of the different approaches slightly diverge in late years. Against the picture drawn in previous studies, these results suggest that once mothers are compared to ex-ante similar non-mothers, motherhood affects life satisfaction positively.

4.2 Comparison to previous approaches

Previous studies which looked at the association between children and life satisfaction have found mostly a negligible or negative motherhood effect. To see whether

our results are driven by our special sample restrictions or by the different identification strategy, we replicate regressions as they are typically found in the literature with the samples used in this study. Thus, motherhood is identified through a dummy variable indicating the presence of at least one child in the household; and contemporaneous realizations for all control variables are employed. For all samples a regression with and without fixed effects is estimated. Table 2 reports the results from estimating such a life satisfaction model. The first two columns with heading "Transition sample" contain the estimates for the sample which was used for the matching approach and the regression with controls for past satisfaction. Column three and four ("FE sample") present the results with observations used in the fixed effects regression. The last two columns ("GSOEP") present results using all women that have participated at least once in the GSOEP.

— — — Table 2 about here — — —

Five out of six estimates are negative and all of them are insignificant, regardless whether fixed effects are included or not. Thus, the standard approach is unable to detect the positive effects of motherhood clearly present when comparing life satisfaction paths of mothers to that of ex-ante similar non-mothers.

4.3 Extensions

We extend our analysis in different directions. First, we examine whether mother's age of first birth affects satisfaction gains obtained from motherhood. Then, we study if motherhood status captures the main effect of the fertility decision on life satisfaction or if one should focus on the number of children. Finally, we explore the effect of fatherhood on life satisfaction. Except where noted otherwise, we use the fixed effect specification in this section.

Age at first birth

Figure 7 shows the effect of motherhood on life satisfaction depending on mother's age at first birth (AFB in the figure). For comparison, the thick line depicts again the average effect for all mothers presented earlier in Figure 6. The effects for different groups of age at first birth are shown by the thin lines. The youngest group, for example, consists of mothers giving birth to their first child between the age 26 and 29. Looking at younger mothers is difficult, because six pre-birth observations are needed to allow for individual-specific fixed effects and an anticipation period of five years. The oldest group consists of women with first delivery between 35 and 37. The different group lines are smoothed to present a visually clearer picture.

— — — Figure 7 about here — — —

The horizontal order of the four lines suggests that the motherhood effect is larger for women having a child later in life.[21] The lines of the two younger groups are below the average line and the curves for the two older groups above. The oldest category have clearly the largest happiness gains. The youngest mothers, on the other hand, seem to be the only group of mothers that suffer from the motherhood status, at least in later years. Since the pregnancy effect seems higher for older groups than for younger groups, one has to be cautious with interpreting the results. If only the difference in the happiness levels directly before and after delivery is considered, the women in the oldest category still profit most and the youngest mothers fewest, but the ranking of the middle groups is less clear.

[21] There are several possible channels which might explain such a pattern. For instance, later timing of first birth is associated with higher wage growth (Herr, 2007).

Single-child and multiple-parity mothers

Figure 8 shows the effect of motherhood on life satisfaction for single child mothers and mothers giving birth to several children in the observation period. Effects for both groups of mothers are strikingly similar a year around childbirth. The differences in life satisfaction levels between the two categories of mothers and non-mothers are small from five years after delivery on. In between, however, multiple-party mothers report higher happiness levels on average. The reason is probably the additional birth taking place during this period. We looked also at the effect of the second child, and the results (not shown) support this interpretation. In about seventy percent of all cases, the time span between birth of the first and second child amounts to four years or less, and the effect of the second child is also positive with a peak at childbirth, albeit the effect is only about half as large as the effect caused by the first child's birth. All in all, these results suggest that the main event or decision in a life of a mother is birth of the first child and the related issue of starting a family. The intensive margin of fertility, number of children, seems less important for the overall evolution of mothers' life satisfaction paths.

— — — Figure 8 about here — — —

Fatherhood

Fatherhood has been left out so far for two reasons. First, identification of fathers identity in the data is far less reliable than mothers. The GSOEP is a household survey and fathers may often not share the same household. Thus, direct pointers are often missing. Second, it is more difficult to define an appropriate age threshold for defining men's completed fertility as their distribution of age at birth exhibits a noticeably longer tail than women's. With these shortcomings in mind, we replicated the estimations for fathers. Again the empirical distribution of age at first birth was

used to determine the maximum age at first birth (47 years).[22]

— — — Figure 9 about here — — —

Figure 9 shows the effect of fatherhood. The results are similar to those of motherhood, however the effect before and at birth seem a bit smaller. Whereas the effect of motherhood in the first year after birth was estimated to be about 0.55 points, the effect of fatherhood is about 0.45. The fixed effects estimator shows a clear decline after two years, stabilizing around 0.1 for the next twenty years; while the matching estimator and the regression with past satisfaction level and trend suggest a slower decline. Thus, both men and women seem to benefit from having a child.

5 Discussion

This paper has presented evidence of self-selection into motherhood and proposed approaches to estimate satisfaction gains of parenthood which account for the positive selection. This is a sharp contrast to the usual analysis in the literature, which relies on *ex-post* comparisons between parents and non-parents and uses observations of prospective parents as part of the control group. We overcome the censoring of potential mothers by the construction of a completed fertility decision sample. Moreover, we find evidence for self-selection into motherhood and account for it in our analyses by using *ex-ante* information on observables and on previous satisfaction paths. The results are robust to the various specifications and consequently confirm the importance to factor selection issues in. Moreover, our estimates contrast with those of the previous literature in that we uncover a positive effect of motherhood -

[22]Until the age of 48, 99.8% of fathers have had their first child. Appendix A6 depicts the estimation sample in detail.

a finding which is in line with a mainstream view of choice behavior based on utility maximization.

The motherhood effect can be put into pecuniary terms. With knowledge of the discount factor in the intertemporal utility function it is possible, in principle, to compute the equivalent amount of household income which makes women indifferent between motherhood and childlessness. We use discount factors of 0.9 and 0.8 to calculate the net present value of motherhood. Estimates of discount factors found in the literature vary considerably (Frederick, Loewenstein and O'Donoghue, 2002). Our first discount factor lies approximately in the middle of the range reported in recent field studies. Discount factors obtained experimentally are typically higher, which is reflected in the second choice. We monetize the yearly satisfaction differentials for mothers (by comparing the respective motherhood coefficient to the coefficients on income) and then discount them to the year before pregnancy using estimates of our specifications with FE and with lags. Based on the FE results, for the median woman motherhood is worth about 1.2 net yearly household incomes using the stronger discount rate, and about 1.7 using the weaker one. Using the results of the regressions with lags, the compensating variation is about 1.1 or 1.9 yearly incomes (based on discount factors 0.8 and 0.9, respectively). These estimates seem reasonable. For instance, couples' willingness to pay for expensive assisted fertility treatments suggest that expected utility gains from motherhood need to be substantial.[23] Another indication of children's high value to parents, happiness losses caused by the death of a child have been valued at similarly high magnitudes (Oswald and Powdthavee, 2008).

Obviously, the utility gains from motherhood are specific to social, technological

[23]Cost-effectiveness studies estimate the cost of live birth at about USD 50,000 (in year 2002 prices; cf. Collins, 2002). In Germany, a part of assisted fertility treatment costs are covered by health insurance. However, there are substantial further non-pecuniary costs such as emotional stress and health risks associated with assisted fertility treatments (Gumus and Lee, 2012).

and other factors. The women surveyed in the German Socio-Economic Panel live in a modern society and a historical moment where birth control is effective, widely available and its use socially accepted; there is universal health care access and the law stipulates extended maternity leaves. Thus, such an environment is probably particularly conducive to large satisfaction gains from motherhood.

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Tables

Table 1: OLS estimates of satisfaction differences between prospective mothers and non-mothers

	(1)	(2)
Pregnancy (9 months to 1 month before birth)	0.71	0.65
	(0.13)	(0.13)
5 years to 10 months before birth	0.23	0.16
	(0.13)	(0.12)
More than 5 years before birth	0.01	0.03
	(0.17)	(0.16)
Socioeconomic control variables	No	Yes
Number of observations	5,756	
Number of individuals	947	

Notes: Cluster robust standard errors in parenthesis. Both regressions include full sets of age dummies and of number of years in panel. The regression in column (2) additionally includes the following control variables: married, boyfriend, single, second order polynomials of weekly working hours and household income and full sets of dummies for education and number of household members.

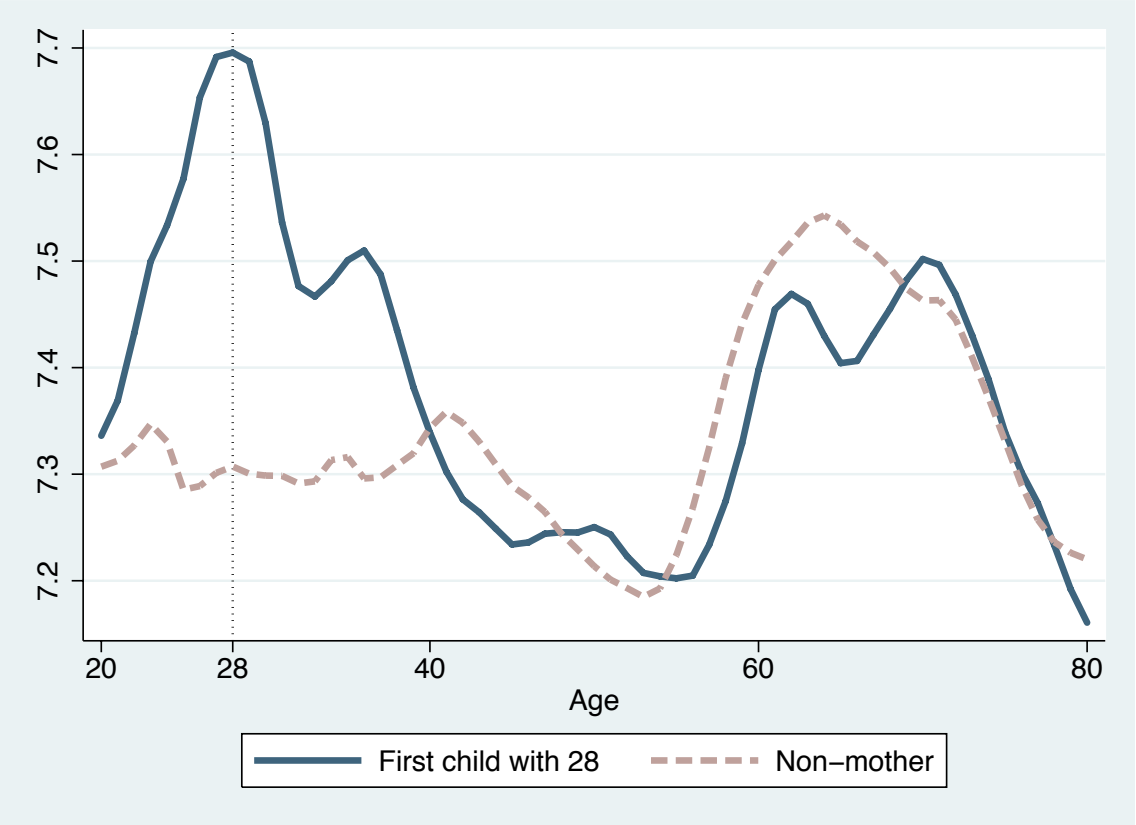
Table 2: Estimates of satisfaction gains of motherhood using standard approaches from the literature

	Transition sample		FE sample		GSOEP	
Child dummy	-0.036	-0.104	-0.004	-0.015	0.028	-0.044
	(0.091)	(0.069)	(0.052)	(0.043)	(0.035)	(0.030)
Individual FE	No	Yes	No	Yes	No	Yes
Number of obs.	25,910		78,470		198,016	
Number of individuals	1,590		9,791		22,510	

Notes: Cluster robust standard errors in parenthesis. The regressions additionally include the following control variables: married, boyfriend, single, second order polynomials of weekly working hours and household income and full sets of dummies for age, education, number of household members and years in panel.

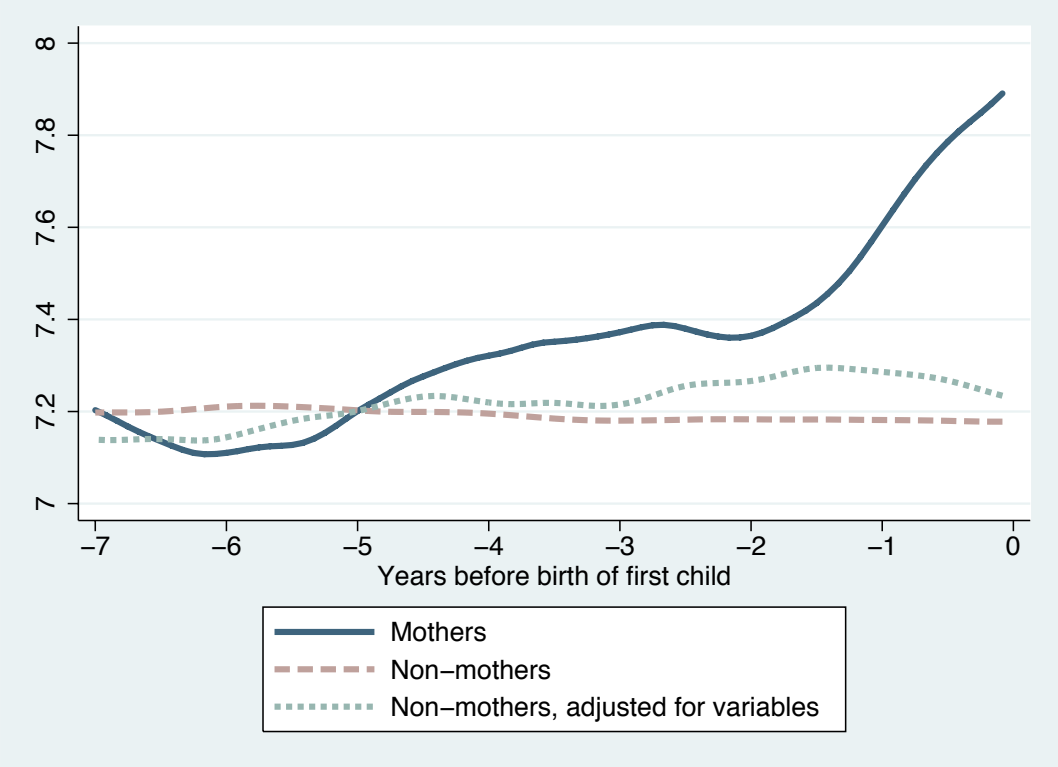
Figures

Figure 1: Life satisfaction over the life cycle



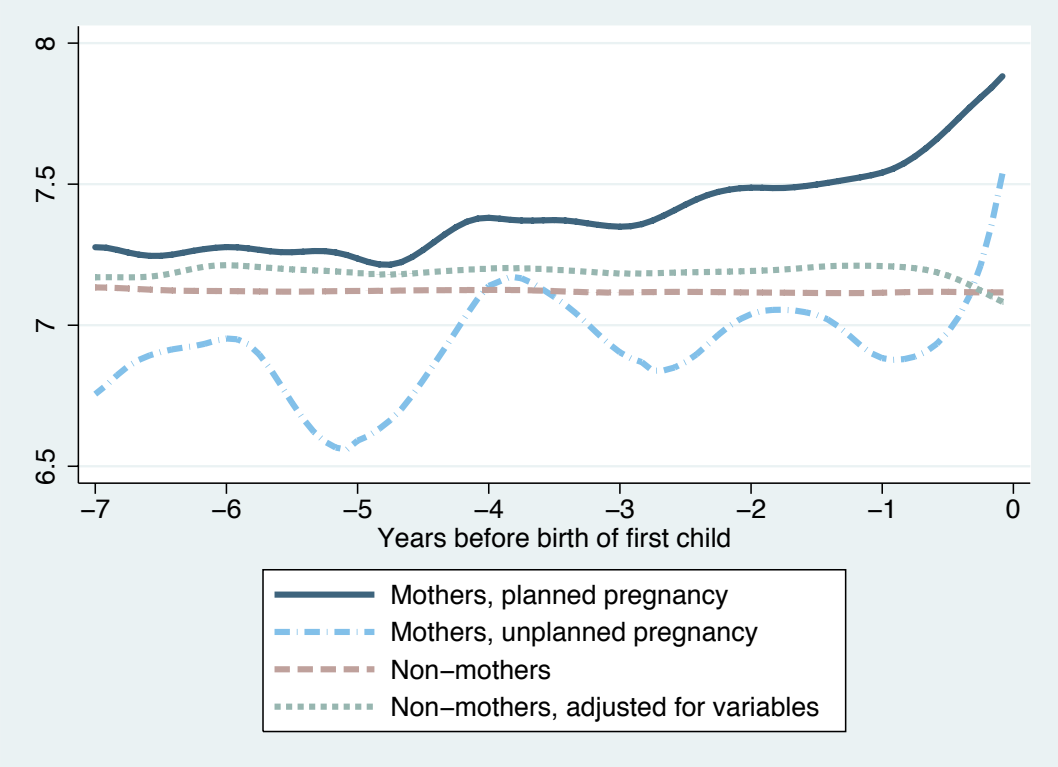
Notes: Data from the GSOEP waves 1984-2009 is detailed in Appendix A1. Displayed average life satisfaction paths are conditional on sets of dummies for survey years and years in panel, smoothed (Lowess) with bandwidth 0.12.

Figure 2: Life satisfaction before birth



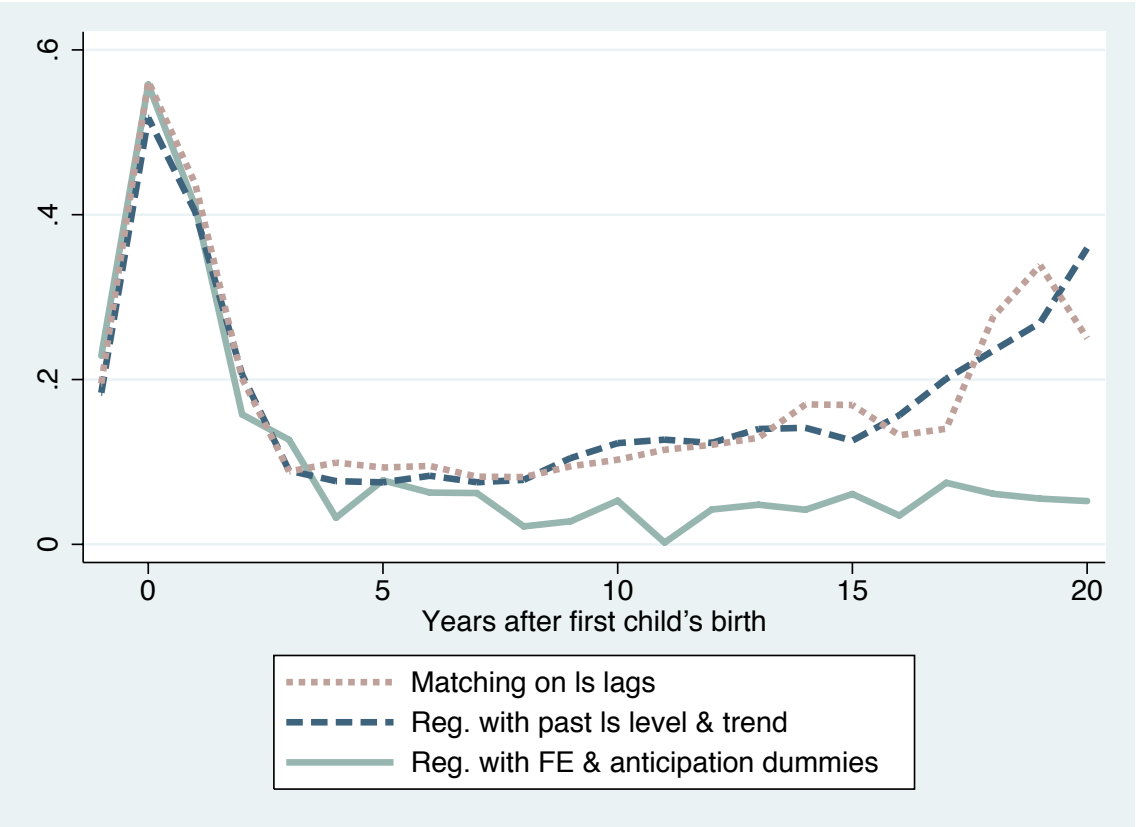
Notes: The graph depicts parameter estimates for the variable **months to birth** in model (1) for a subset of 7 years. The data is detailed in Appendix A2. Displayed average life satisfaction paths are conditional on sets of dummies for survey years and years in panel. Predicted life satisfaction adjusted for variables further includes controls for education, relationship status, household members, working hours and household income. All lines smoothed (Lowess) with bandwidth 0.3 Appendix A0 contains a detailed description of the included terms.

Figure 3: Life satisfaction before birth - Planned v. unplanned pregnancies



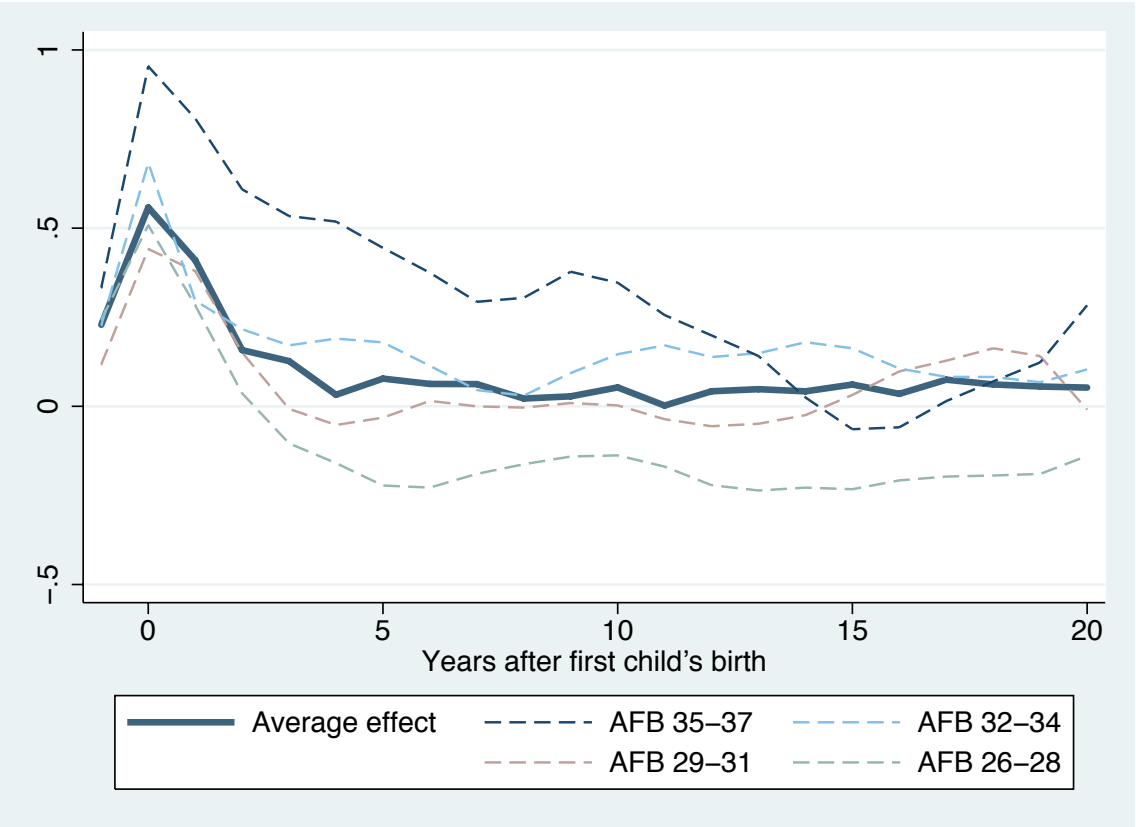
Notes: The graph depicts parameter estimates for the variable **months to birth** in model (1) interacted with a dummy indicating whether motherhood was planned or not, for a subset of 7 years. The data is detailed in Appendix A3. Displayed average life satisfaction paths are conditional on sets of dummies for survey years and years in panel. Predicted life satisfaction adjusted for variables further includes controls for education, relationship status, household members, working hours and household income. All lines smoothed (Lowess) with bandwidth 0.3. Appendix A0 contains a detailed description of the included terms.

Figure 4: Estimated life satisfaction (ls) gains of motherhood



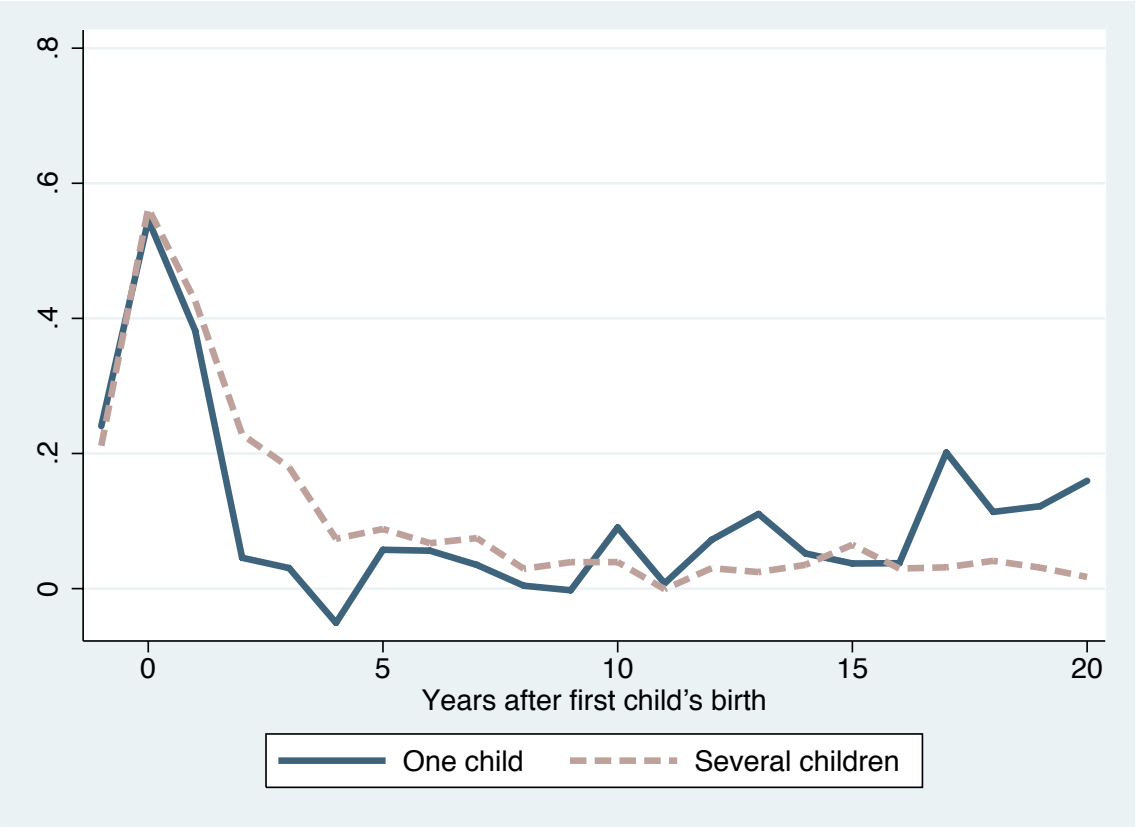
Notes: Matching estimates correspond to β_p in model (2) using the data detailed in Appendix A4. Matching is achieved on past satisfaction levels from minus two to minus five years and other lagged covariates. Regression with past life satisfaction level and trend correspond to the estimates of β in model (3). The regression uses the same data as the matching approach. It controls, besides other covariates, for average happiness level two to four years before delivery and the average change in the yearly happiness level in the same period. Fixed effect estimates correspond to β in model (4). The estimation includes four extra dummies for minus two to minus five years before first birth and employs the data introduced in Appendix A5. Matching and reg. with past ls level & trend lines smoothed (Lowess) with bandwidth 0.15.

Figure 5: Estimated life satisfaction gains of motherhood for different age-at-first-birth (AFB) groups – FE regression



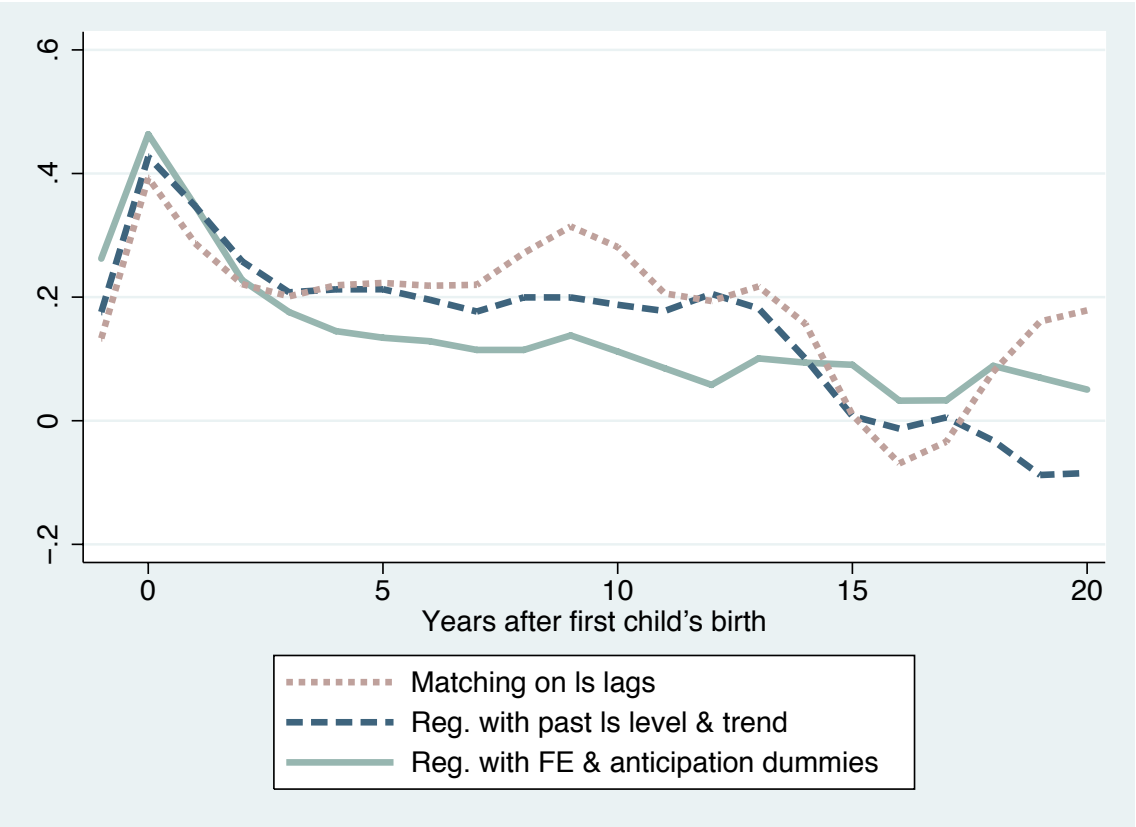
Notes: The thick line shows again the average motherhood effect (β in model 4) from Figure 4. The thin lines show the estimated motherhood effect of model (4) interacted with age of first birth. All regressions includes four extra dummies for minus two to minus five years before first birth. The data is introduced in Appendix A5. Thin lines smoothed (Lowess) with bandwidth 0.15.

Figure 6: Estimated life satisfaction gains of motherhood for single-child and multiple-parity mothers – FE regression



Notes: The lines show the estimated motherhood effect of model (4) interacted with a variable indicating if the mother has one child, or more than one child over her life span. All regressions includes four extra dummies for minus two to minus five years before first birth. The data is introduced in Appendix A5.

Figure 7: Estimated life satisfaction (ls) gains of fatherhood



Notes: The lines show the fatherhood effect estimated with different approaches. Notes to estimation approaches can be found in Figure 4. The data is introduced in Appendix A6. All lines smoothed (Lowess) with bandwidth 0.15.

Appendix A – Data

We use data from the German Socio Economic Panel (GSOEP). The GSOEP exhibits at least three features that benefit the analysis of motherhood. First, person pointers identify a respondent's mother and children. Second, we have access to 25 yearly waves, starting in 1984. This permits us to identify women with fertility equal to zero over their entire life, but to observe these non-mothers during possibly fertile years. Third, information on the type of pregnancy (planned or unplanned) is available from a special mother and child questionnaire for the subset of mothers with year of first birth 2002 or later.

Appendix A0 shortly documents how different variables were constructed and how they were integrated as control variables in the regressions. Appendices A1 to A6 describe the subsamples generated from the GSOEP for this study's analyses. Means of selected variables are depicted in Table A.

A0 – Variables used

Original variable names as they appear the first time in the GSOEP are reported in parentheses. Household (ahhnr) and never changing person (persnr) numbers identify households and individuals. Pointers to person numbers define a respondent's mother (mnr, akmutti, bymnr or persnrm), father (byvnr, vnr) and children (kidpnr or idperschild). The dependent variable, life satisfaction, was assessed by asking respondends: "*In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer according to the following scale: 0 means completely dissatisfied, 10 means completely satisfied. How satisfied are you with your life, all things considered?*" (p1110184). Birth year (gebjahr) was used together with survey year to construct age. Exact ages of a mothers' children were computed through birth dates of a child (kidmon, kidgeb) and interview dates of a mother (bpmonin, ahtagin). Years in panel was generated from the number of a

respondents' observations in our data.

In all estimations presented in this study, complete sets of indicator variables control for age, survey year and number of years in panel. Estimates controlling for socioeconomic factors include the following set of variables: seven dummies categories of completed education (apsbil) (secondary school degree, intermediate school degree, technical school degree, upper secondary degree, other degree, dropout, no school degree yet); three dummies for relationship (ap58) married, boyfriend, single; complete set of dummies for numbers of household members (ahhgr); a second order polynomial for weekly hours worked (atatzeit) that range from 0 to 80; a dummy indicating whether hours were reported (58%) or not; household income (hinc84) and household income squared for monthly salaries between 0 and 100,000 Euros and a dummy for reported household income (95%). Moreover, for the pre-birth period analysis the dummy variable planned pregnancy (bcssplan) is used.

A1 – Life cycle sample

The life cycle analyses include all observations on non-mothers with a fertility of zero at age 40 and on mothers with age of first birth equal to 28 years, aged 20 to 80 during waves 1984 to 2009 and reporting valid answers to the questions in this study. This yields 25,773 observations for 3,885 women.

A2 – Pre-birth completed fertility sample

The pre-birth analysis contrasts pre-birth life satisfaction of mothers-to-be to that of similar non-mothers. Given a threshold of 40 years for a completed fertility decision by the age of 40, prospective mothers are younger than 41 years. This maximum age is imposed on non-mothers' ages, too. This implies that non-mothers are born before 1968. In return, this cohort restriction is applied to mothers' birth cohorts. Moreover, for pre-birth analyses exact ages of respondents' offspring were

used. These restrictions leave 5,756 observations for 947 women.

A3 – Pre-birth "birth-type" sample

The GSOEP mother and child questionnaire is in field since 2003 and covers new mothers from 2002 on. Out of 1,249 new mothers who answered the question, 70% judged that their pregnancy was more planned than unplanned. Due to the questionnaire's inception date, the information is available for mothers aged maximally 46 years in 2009. To obtain a same-aged control group, the completed fertility decision sample's non-mothers are replaced by potential non-mothers, i.e. contemporaneously childless women. In order to find the same range of age for both mothers and non-mothers, we impose potential non-mothers not to be born before 1959 and not to exceed the age of 40. This leaves us with 14,879 observations for 2,572 individuals. For all of these women first child's exact birth date are available.

A4 – Transition sample

Implications of matching or controling on pre-birth life satisfaction are threefold. First, transition into motherhood needs to be observed. This implies that mothers' age cannot exceed 60 years in our sample. We apply this age restriction also to non-mothers. Second, pre-birth observations need to be observed such that controlling or matching on past life satisfaction paths is feasible. For 1,590 women –with 25,910 observations– past satisfaction levels and trends are identified. Third, our analyses considers mothers one year before first child's birth. To find similar, same-aged non-mothers we use all possible ages of non-mothers. This implies that, if possible, non-mothers are "cloned" and used multiple times with covariates measured at the corresponding age. The total number of observations is then 37,616. Cloning induces an obvious dependence between cloned observations. All reported standard errors and test statistics account for arbitrary clustering and heteroskedasticity of any type

at the individual level, and therefore account for the dependence between multiple observations of non-mothers.

A5 – Fixed effect estimation sample

Fixed effect regressions estimate the effect of motherhood for women aged 20 to 60. The GSOEP provides information about 13,652 women whose ages fall into this interval. Again, only women with a completed fertility decision are retained in the sample. We are left with 78,470 observations for 9,791 individuals.

A6 – Father sample

For the analysis of fatherhood valid responses of male participants from GSOEP waves 1984 to 2009 are used. As for women, the age by which the fertility decision is completed is defined by means of the data at hand. Mean and median age of first birth for men are equal to 27 and 28 years. 99.6% of all fathers had their first child before the age of 48. We thus define non-fathers as men who have not fathered a child until the age of 48. The sample consists of 82,261 observations for 8,449 men.

Table A: Means of selected variables for different samples

	A1	A2	A3	A4	A5	A6
Proportion parents	0.35	0.52	0.35	0.81	0.90	0.93
Age	51.86	30.45	27.58	31.09	34.87	39.48
Net-monthly HH-income in Euros	2137.08	2002.23	2048.06	2200.68	2235.64	2439.54
Weekly hours worked	17.64	33.69	31.10	23.38	20.15	38.06
Proportion high school degrees	0.19	0.25	0.33	0.23	0.18	0.19
Proportion school drop outs	0.03	0.02	0.02	0.03	0.04	0.03
Proportion married	0.55	0.34	0.22	0.49	0.63	0.69
Proportion with partner	0.16	0.36	0.54	0.29	0.18	0.15
Proportion single	0.22	0.16	0.22	0.14	0.09	0.08
Number of observations	25,773	5,756	14,879	25,910	78,470	82,261
Number of individuals	3,885	947	2,572	1,590	9,791	8,449

Appendix B - Regression Output

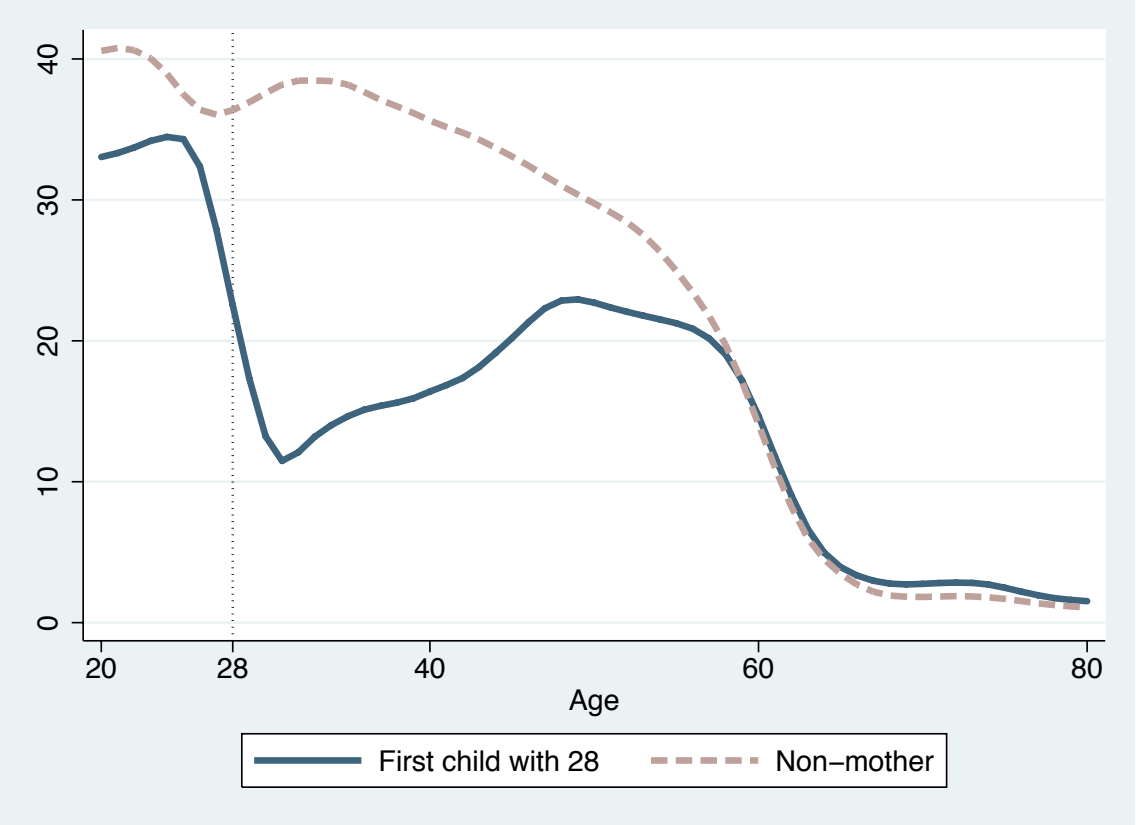
Table B: Regression coefficients of Figure 2

	Equation (2)		Equation (3)		Equation (4)	
Years after first child's birth:						
-1	0.20	(0.07)	0.18	(0.10)	0.23	(0.07)
0	0.56	(0.07)	0.52	(0.10)	0.56	(0.08)
1	0.44	(0.07)	0.40	(0.11)	0.41	(0.08)
2	0.04	(0.07)	0.11	(0.10)	0.16	(0.09)
3	0.14	(0.08)	0.12	(0.11)	0.13	(0.09)
4	0.05	(0.08)	0.03	(0.11)	0.03	(0.10)
5	0.12	(0.09)	0.11	(0.11)	0.08	(0.10)
6	0.09	(0.09)	0.07	(0.11)	0.06	(0.11)
7	0.08	(0.10)	0.07	(0.11)	0.06	(0.12)
8	0.08	(0.11)	0.08	(0.12)	0.02	(0.12)
9	0.08	(0.11)	0.08	(0.12)	0.03	(0.12)
10	0.12	(0.12)	0.17	(0.12)	0.05	(0.13)
11	0.09	(0.13)	0.10	(0.13)	0.00	(0.14)
12	0.14	(0.14)	0.13	(0.14)	0.04	(0.14)
13	0.12	(0.15)	0.14	(0.14)	0.05	(0.14)
14	0.13	(0.18)	0.15	(0.16)	0.04	(0.15)
15	0.27	(0.19)	0.12	(0.17)	0.06	(0.15)
16	0.05	(0.22)	0.10	(0.18)	0.03	(0.16)
17	0.12	(0.23)	0.27	(0.20)	0.07	(0.16)
18	0.27	(0.26)	0.19	(0.20)	0.06	(0.17)
19	0.44	(0.31)	0.26	(0.22)	0.06	(0.17)
20	0.25	(0.59)	0.36	(0.29)	0.05	(0.18)
Number of observations			37,616		78,470	
Number of clusters			1,590		9,791	
F-statistic			5.74		14.37	

Note: The table shows the point estimates of the motherhood effect for different estimations strategies (equation (2): Matching; equation (3): Regression using past satisfaction levels and trends; equation (4): Fixed effects regression accounting for the anticipation effect). Cluster robust standard errors in parenthesis. The estimates are graphically presented in Figure 2. F-statistic for the hypothesis that all shown coefficients are equal to zero. The critical value at the 1% level is 1.85.

Appendix C – Additional Figures

Figure A: Weekly working hours over the life cycle



Notes: Data from the GSOEP waves 1984-2009 is detailed in Appendix A1. Displayed average life satisfaction paths are conditional on sets of dummies for survey years and years in panel, smoothed (Lowess) with bandwidth 0.12.