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ABSTRACT

Socioemotional Skills in Early Childhood: Evidence from a Maternal Psychosocial Intervention*

We study the formation of social and emotional skills in the first three years of life, and investigate the impact of a cluster-randomized peer-led psychosocial intervention targeting perinatally depressed mothers in rural Pakistan. The intervention significantly improved maternal mental health, especially among mothers of boys. It resulted in imprecisely estimated increases in parental investment, without any discernible impacts on the child's socioemotional skills or on indicators of their development in the cognitive and physical health domains. A descriptive analysis of mechanisms reveals that the intervention modified the production function of children's skills, by lowering the productivity of maternal mental health in the first 12 months of life. It moved outcomes for depressed women closer to outcomes for women not depressed during pregnancy.

JEL Classification: D1, I1, J1, O2

Keywords: mental health, stress, socioemotional, RCT, child development, technology of skill formation, gender

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1 Introduction

There is increasing evidence that social and emotional skills are an integral component of mental health and human capital (Heckman and Rubinstein, 2001), and that these skills are malleable (Heckman et al., 2014). In line with this evidence, schools are increasingly adopting strategies to promote socioemotional skills in children (Nangle et al., 2020; O'Connor and Hayes, 2020). However, socioemotional difficulties become apparent early in life and are prone to get ingrained, and intensify over time (e.g. Feil et al., 1995; Sprague and Walker, 2000). There is evidence that socioemotional difficulties at age 1-3 are predictive of socioemotional difficulties in elementary school (Briggs-Gowan and Carter, 2008) and that socioemotional disposition in school is predictive of mental health disorders in early adulthood (Class et al., 2019; National Scientific Council on the Developing Child, 2012). This makes it important to identify and address these problems early in life.

In this paper, we analyse the dynamic evolution of socioemotional skills from birth through till the child is three years of age, as a function of the mother's mental health as it evolves from birth onwards. The mother is the primary caregiver in our setting and, in general, the child interacts with her more than anyone else. As a result, her mental health and her behaviours have a potentially strong influence on the child. Depression and stress often manifest in low energy, impaired functionality, insomnia, poor concentration, pessimism, and a lack of interest in one's environment (de Quidt and Haushofer, 2018). It thus seems plausible that depression modifies the mother's parenting behaviors (Herba et al., 2016; Baranov et al., 2020; Angelucci and Bennett, 2021).

A distinctive feature of our study is that it uses experimental variation generated by a peer-led psychosocial intervention targeting perinatally depressed women in rural Pakistan. It analyses the extent to which the intervention changes the developmental trajectory for children in general and, in particular, the early life path of their socioemotional skills. The intervention started in the third trimester of pregnancy and con-

tinued till the child was 36 months old. It provided cognitive behavioral therapy with a focus on behavioral activation, self-care, and the child's health and development. We gathered rich longitudinal data on mother-child pairs in five waves- in pregnancy (baseline) and at 6, 12, 24, and 36 months postpartum. In addition to modelling the evolution of the child's socioemotional skills in response to the intervention, we study the child's cognitive and physical development. In particular, we allow that socioemotional skills at any stage of life may depend upon past levels of physical and cognitive development.

We measure socioemotional skills using validated psychometric indices that capture competencies in self-regulation, adaptive functioning, emotional balance, communication, and prosociality. We measure maternal mental health using established scales for measurement of depression, stress, and functional-(dis)ability.

In order to link the observed variables in the dataset to the underlying developmental trajectories of children, a latent variable approach is used. We generate factors scores and use these to estimate treatment effects on six sets of outcomes: cognition, physical and socioemotional skills of the child, parental investment, maternal mental health, and maternal functioning. We then estimate the production functions of child skills, health, and parental investment to determine how different components of child development interact.

We make two contributions. First, we identify impacts of the intervention on trajectories of maternal mental health, parenting, and child development. Second, we attempt to shed light on the mechanisms by which the intervention might improve early childhood socioemotional skills. The estimation follows the seminal work of Cunha and Heckman (2008); Cunha et al. (2010); Attanasio et al. (2020a). We allow that the intervention changes the production function of children's skills by increasing investments in children or raising their productivity. In a departure from previous work, we include maternal mental health as another form of capital in the production function of child skills. This allows us to think of it as a stock that can depreciate, or that can be in-

vested in (with the intervention), and which exhibits decreasing returns. We will argue that this conceptualization is useful in identifying the channels through which the intervention can impact depressed women and their children, and bring their outcomes closer to those of women who were not depressed during pregnancy.

We find that the psychosocial intervention on mothers has a significant impact on maternal mental health and functioning that is evident through to the end of the intervention, when the child is 36 months old. These impacts are stronger among mothers of boys. The intervention results in weakly identified increases in parental investment, without any discernible impacts on the child's socioemotional skills or on indicators of their development in other domains.

A descriptive analysis of mechanisms reveals that the intervention modifies the production of child skills, particularly in infancy. The estimated intervention impacts are, in general, weaker when the child is age three. Consistent with this, differences in child outcomes between women who were and were not depressed at baseline are also attenuated by age three.

The production function estimates reveal that, in the control group, child socioemotional (and other) skills are increasing in maternal mental health. The intervention weakens this association. A plausible explanation of this result is that, among women who have recovered from depression (or high levels of stress), small variations in the underlying measure of mental health are less predictive of child development. In general, these descriptive intervention shifts mirror the descriptive impacts of the mother not having been depressed in pregnancy, consistent with the intervention moving outcomes of depressed women closer to outcomes of non-depressed women. We also see a significant increase in productivity (in the production of socioemotional skills) in the treated group.

Understanding how maternal depression at birth may influence the formation of socioemotional skills in the early years is important given how prevalent maternal depression is: it is estimated that between 10 and 30 percent of children worldwide are

exposed to maternal depression at birth, and that this share is higher in developing countries (O'hara and Swain, 1996; Parsons et al., 2012). Maternal depression is often undiagnosed and untreated, and between a third and a half of all women who are depressed during pregnancy remain depressed a year later, which implies a significant duration of exposure for many children.

A number of studies have documented that socioemotional skills in childhood are predictive of adult outcomes including mental health, educational attainment, and earnings (Currie and Stabile, 2006; Bennett et al., 2016; Halfon et al., 2014). Another strand of the literature demonstrates that socioemotional skills have an even longer-lasting impact, influencing the next generation. In particular, a number of studies show a positive intergenerational correlation in socioemotional skills (Loehlin, 2005; Groves, 2005; Anger, 2012; Dohmen et al., 2012; Grönqvist et al., 2017; Attanasio et al., 2022a).

Most of the cited studies measure socioemotional outcomes in adolescence or adulthood. One study that, like us, measures socioemotional outcomes in childhood is Attanasio et al. (2022a). However, they associate the child's outcome with the mother's socioemotional skills when she was a child, whereas we are primarily interested in the mother's socioemotional skills when she is parenting the newborn child. A second difference in our study from the cited literature is that it is set in a developing country, and we know much less about socioemotional developmental paths in these settings. Third, none of the cited studies uses experimental variation in the mother's socioemotional skills.

The paper is laid out as follows. Section 2 provides the details of the intervention, discusses baseline balance and attrition over time, describes the data set and the outcomes, and discusses the methodology used to reduce the dimensionality of the outcome space and estimate the treatment effects; Section 3 presents the empirical results; Section 4 discusses the mechanisms through the lens of a simple structural model; and Section 5 concludes.

2 Study Design and Data

2.1 The Intervention

We use longitudinal data on a pregnancy-birth cohort, established in the context of a clustered Randomized Controlled Trial (RCT) in rural Punjab, Pakistan, a low-resource context characterized by the high prevalence of maternal depression and limited access to clinical mental health care. The trial recruited women who were perinatally depressed and provided them with a 3-year-long, peer-delivered psychosocial intervention (THPP+) consisting of cognitive behavioral therapy with a focus on behavioral activation, self-care, and attention to the infant's health and development.

Depression Screening. Between October 2014 and February 2016, all pregnant women who were eligible for the study—married, resident in Kallar Syedan, a subdistrict of Rawalpindi in Pakistan, not in need of immediate medical attention—were approached and screened for depression using the Patient Health Questionnaire (PHQ-9). The PHQ-9 is a standard instrument for screening and monitoring the severity of depression; it includes questions about the frequency of depressive symptoms in the last two weeks, such as lack of interest or ability to concentrate, feelings of sadness or hopelessness, sleeping or eating problems, restlessness, suicidal thoughts. Pregnant women who scored 10 or greater on the PHQ-9 were invited to participate in the trial.

Among 1731 women who were screened for depression, 572 (33%) were identified as depressed according to the PHQ-9 criteria. 287 of these mothers were in the clusters randomized to the intervention, 283 in the control arm, and two mothers refused to participate before the baseline assessment. Of the 1159 pregnant women who were screened as not depressed, 584 were randomly selected to constitute the non-depressed arm of the study. They represent a natural reference group to understand the evolution of maternal and child outcomes, and to benchmark the potential effectiveness of the intervention.

Randomization. The trial was randomized across 40 village clusters. These clusters

were geographically separate to minimize risk of spillovers. Twenty clusters were randomized into receiving the intervention and twenty to the control arm. Each village cluster contributed approximately 14 perinatally depressed women. Research teams responsible for identifying, obtaining consent, allocating, and interviewing study participants were blind to the participants' original depression status and their allocation in the study arms.

THPP+ Intervention. Thinking Healthy Programme Peer-Delivered Plus (THPP+) is a low-intensity scaleable psychosocial intervention delivered by volunteer peer women from the same community as the mother. Peers received prior classroom training in accordance with the intervention content, which builds on a previous intervention that proved very successful in a similar context (Rahman et al., 2008). They were provided supervision throughout the trial period. The intervention strategy includes behavioral activation to overcome unhealthy thinking with a focus on self-care and infant development.

The timeline of the THPP+ intervention and all follow-ups are summarized in Figure 1. Depressed women in the intervention arm received a combination of individual and group sessions. From the third trimester of pregnancy until 6 months after childbirth, ten individual and four group-based sessions were held focusing on altering the unhealthy behaviors. From 7 months to 36 months postnatal, another 18 group sessions were delivered: the first six sessions were delivered monthly, the rest every two months. The content of these lower-intensity booster sessions was a continuation of the behavioral activation strategy with a special focus on contributing to the mother-child interaction and child development by providing examples of age-appropriate activities as well as information about childcare. Since a large part of the intervention was delivered in group sessions, the social component of meeting with other mothers, alongside the behavioural activation content discussed during the sessions, might have jointly contributed to any intervention effects.

Perinatally depressed women in the treatment arm received the THPP+ intervention throughout the trial, while the women in the control arm received Enhanced Usual

Care (EUC). EUC is the routine health care provider in the region. It is enhanced in the sense that the participants were informed of their depression status and offered guidance about how to seek help. Women who were not diagnosed as perinatally depressed (non-depressed group) did not receive any treatment. [1]

Sample and longitudinal follow up. Our study sample consists of the experimental group of depressed mothers who were randomized into treatment and control arms, and the group of mothers who were not depressed at baseline. Data collection on the mother-child dyads was done six times throughout the trial: at the third trimester of pregnancy and 3, 6, 12, 24, and 36 months postpartum. Figure 1 provides the compositions of the follow-up samples and the respective loss-to-follow-up rates (LTFU).

2.2 Balance and Attrition

Balance: The experimental sample was slightly imbalanced at baseline, as shown by the summary statistics in Table 1. For instance, pregnant women in the treatment arm were on average 1 cm taller and lived in households with 0.3 more people per room than women in the control clusters. Treated women also suffered from slightly—albeit not significantly—worse mental health, scoring 0.4 higher on the PHQ-9 (depression), 0.6 on the WHODAS (functioning), and 0.9 on the PSS (stress). A joint F-test rejects the balance of baseline characteristics (p-value=0.01).[2] Splitting the baseline sample by gender of the index child shows that the sample of mothers of boys is more balanced than that of girls: treated mothers of girls scored 1.6 higher on the PSS, had 0.5 higher number of people per room, lower socio-economic status and less educated husbands (Table A6). Overall, a joint test of balance for covariates within each group of gender does not yield any significant imbalance (p-values of 0.41 for mothers of boys and 0.12 for mothers of girls). We further confirm balance across study arms by using the mothers who were not depressed at the baseline (Table A7). A joint test of balance for

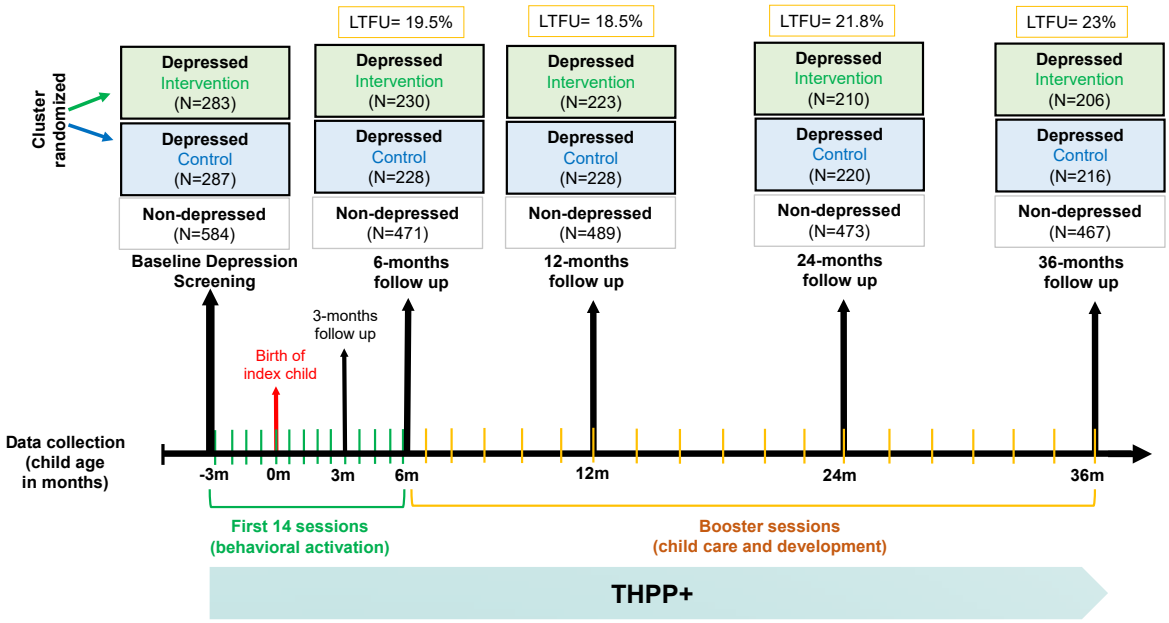
[1] More information about the trial is in Sikander et al. (2015, 2019a,b); Turner et al. (2016).

[2] We regress a treatment dummy on all the baseline controls and report the p-value of the F-test of overall significance.

non-depressed mothers' baseline characteristics across treatment and control clusters yields p-value of 0.456. Similarly, a joint test of balance using the whole sample (non-depressed and depressed mothers pooled) is not rejected. (p-value=0.317).

Attrition: Lost to follow-up (LTFU) rates range between 18.5%-23% throughout the study period. The main reason for being lost to follow-up was the loss of the index child (constituting around 40% of the attritors) which was balanced across study arms. Attrition did not differ by treatment status, despite some small imbalance in attritor characteristics (Tables A2-A5). Attritors generally had more crowded households and higher baseline PHQ-9 total scores. Attritors at 6 months additionally differ by having higher blood pressure and lower socio-economic status, and were more likely to be pregnant for the first time. At the 24-month follow-up, attritors had higher WHO-DAS and PSS scores, a higher number of girls, and less educated husbands. Mothers who were lost to 36-month follow-up had higher weight and were more likely to co-reside with their mother or mother-in-law. Jointly testing for the difference in attritor characteristics by treatment status yields balance in all follow-up points with the exception of the 24-month follow-up. At 24 months, a joint test for balance is rejected (p-value=0.046).

Figure 1: Timeline of THPP+ Intervention and Follow-ups



2.3 Measurement and Outcomes

The unusually rich data contain multiple validated and widely used scales and indicators of maternal mental health and functioning, as well as cognition, socioemotional and physical health of their children. A full list of measures is provided in Table A1 in the Appendix.

To measure **maternal** mental health across all of the waves, we use the Patient Health Questionnaire (PHQ-9) and the Structured Clinical Interview for DSM (SCID), a 13-item semi-structured interview for making the major DSM-5 diagnoses. We also include the Cohen Perceived Stress Scale (PSS), a 10-item instrument among the most widely used in the psychological literature to measure self-reported stress. To measure her functioning, we use the WHO Disability Assessment Schedule (WHO-DAS) for maternal functioning, a 17-item assessment instrument for health and disability.

To measure the **child**'s cognitive development at age 12 and 36 months, we use 5 scales of the Bayley Scales of Infant Development (Bayley-III) assessing infant and toddler de-

velopment in the following domains: Cognitive, Language (Receptive and Expressive), and Motor (Gross and Fine).

To measure the child's socioemotional skills from 6 months onward we use the Ages and Stages Questionnaire: Social-Emotional sub-scale (ASQ-SE), a validated tool for identifying children at risk of a neurodevelopmental disorder. The ASQ-SE has components to assess self-regulation, compliance, communication, adaptive functioning, autonomy, interaction with people and affect (the child's ability or willingness to demonstrate their own feelings and empathy for others). At age 36 months we also include the Strengths and Difficulties Questionnaire (SDQ), a brief behavioral screening questionnaire used to assess children's mental health. It has sub-scales to detect emotional symptoms, conduct problems, hyperactivity and inattention, peer relationship problems and prosocial behaviour.

The child's physical health is proxied using their anthropometrics: the assessor measured the child's weight, height, and head circumference from 3 to 36 months, which were then converted to age-adjusted Z-scores.

To measure **parental investment**, at 12, and 36 months we used the HOME inventory, a widely-used observational measure of the quality of the cognitive stimulation and emotional support provided to the child. At 24 months we used the Observation of Mother-Child Interaction (OMCI), a tool used to capture parental sensitivity and responsiveness.

Given the richness of the data for both mothers and children, we aggregate outcomes into indices to overcome measurement error problems, improve statistical power, reduce the dimensionality of the data and mitigate the resulting issue of multiple hypothesis testing. We consider two forms of aggregation: inverse covariance weighted indices, and latent factor scores.

2.3.1 Inverse Covariance Weighted (ICW) Index

Following Kling et al. (2007) and Anderson (2008), we construct ICW indices by weighting the mean vector of outcomes by the row-sum of the inverse of their covariance matrix. ICW indices are useful to minimize the noise resulting from random errors that are uncorrelated across indicators and provide an efficient estimation of the treatment effect by allowing a single hypothesis testing and increasing statistical power. They also offer flexibility to aggregate information from the observed measures that are not highly correlated or from different domains. In fact, the ICW index puts more weight on the measures that are less correlated and thus capture new information. That's why, apart from estimating an index for each domain of child and maternal outcomes, we also construct an overall ICW index (e.g., child index) to capture a comprehensive effect of treatment on mothers and their children. Each index for each domain at each time point is normalized to have a mean of 0 and a standard deviation of 1 in the control group.

2.3.2 Latent Factor Scores

Following a long history in psychometrics (Spearman, 1904) and a more recent one in economics (Cunha and Heckman, 2008; Cunha et al., 2010; Attanasio et al., 2020a,c), we construct latent factor scores leveraging the correlation structure of the outcomes. Latent factor analysis is a model-based approach that reduces the measurement error and the dimensionality of the outcomes under the assumption that a latent variable exists and explains all of the correlations between related outcomes.

Specifically, assuming dedicated measurements for each latent factor θ, we denote the j-th measure of the child's skill of type k at time t with m^{θ}_{kjdt}, j-th measure of parental skills at t with m^{P}_{jdt} and j-th measure of parental investment at t with m^{I}_{jdt}, where $d = 0$ indicates the control group and $d = 1$ indicates the treatment group. We assume a semi-log relationship linking the observed measures to the unobserved latent trait as follows:

$$m^{\theta}_{kjdt} = \mu^{\theta}_{kjt} + \alpha^{\theta}_{kjt} \ln \theta^{k}_{dt} + \epsilon^{\theta}_{kjt} \tag{1}$$

$$m^{P}_{jdt} = \mu^{P}_{jt} + \alpha^{P}_{jt} \ln P_{dt} + \epsilon^{P}_{jt} \tag{2}$$

$$m^{I}_{jdt} = \mu^{I}_{jt} + \alpha^{I}_{jt} \ln I_{dt} + \epsilon^{I}_{jt} \tag{3}$$

where $(\theta^{k}_{dt}, P_{dt}, I_{dt})$ are the latent factors for child skills, parental outcomes, and parental investment, $(\mu^{\theta}_{kjt}, \mu^{P}_{jt}, \mu^{I}_{jt})$ represent the intercepts, $(\alpha^{\theta}_{kjt}, \alpha^{P}_{jt}, \alpha^{I}_{jt})$ are factor loadings, and $(\epsilon^{\theta}_{kjt}, \epsilon^{P}_{jt}, \epsilon^{I}_{jt})$ are the error terms capturing measurement error, assumed to be normally distributed, with mean zero, independent of the latent factors and of each other.[3]

For identification purposes, the scale and the location of the latent log-factors are set by normalizing the measure that has the highest factor loading of each latent factor to one, i.e. $\alpha^{\theta}_{k1t} = \alpha^{P}_{1t} = \alpha^{I}_{1t} = 1$. For longitudinal comparison purposes, we normalize each factor on the same measure at all time points.[4] Regarding the location, since we are interested in the mean comparison between groups and over time, we fix the means of the latent factors in logs to 0 for the control group only at the initial time point (6 months) following Agostinelli and Wiswall (2016). This allows us to capture the growth of the latent factors over time.

Using exploratory factor analysis (EFA), we reduce the number of items contributing to each latent factor by discarding the ones that do not strongly correlate with the underlying latent trait of interest. The details of the EFA are reported in Section C.1 in the appendix. Next, we jointly estimate the measurement system using a maximum likelihood estimator, and predict factor scores for each individual in the sample.

[3] We allow the cross-time correlation of the residuals to be non-zero for the measures that are asked at multiple time points.

[4] For child physical health, we normalize to one the weight-for-age z score; child cognition is normalized on Bayley-III fine motor scale score; socioemotional skills are normalized on the ASQ-SE item 'when upset, whether the baby can calm down within a half hour'; maternal mental health is normalized on the SCID item 'current major depressive episode'; maternal functioning is normalized on the WHODAS item 'difficulty affecting day-to-day work'; parental investment is normalized on the HOME subscale of learning materials.

The results of the estimation of the measurement system are reported in Tables A9-A15. To provide summary statistics for the importance of each measure in the system, we report the signal-to-noise ratio.[5] The results indicate that the information contained in each measure of the same factor varies a lot, and that most measures are quite far from a 100% signal-to-noise ratio. This provides a justification for the latent variable approach to modelling child skill formation. Without such an approach, one would fail to capture the variety of aspects of child development in the early years of life.

3 Treatment effects

We estimate intention-to-treat (ITT) effects on each indicator as well as on the estimated aggregate summary indices (ICW indices and latent factor scores) for the domains of maternal mental health and functioning, child cognition, physical and socioemotional skills, and parental investment (Tables 2-5). We report the mean of the outcomes for each of the three groups (control, treatment, and non-depressed) and the mean differences between treatment and control clusters (Diff. (T-C)). As our baseline and follow-up samples were not completely balanced along baseline characteristics, we also present the treatment effect coefficients adjusted for the full set of baseline characteristics (demeaned) and their interactions with the treatment indicator (adjusted β).[6] Including interactions with treatment allows us to control for the possible heterogeneity in the impacts of these characteristics on outcomes. All regressions control for interview date, interviewer fixed effects and union council fixed effect (stratification unit). Reported standard errors are clustered at the village level (i.e., randomization unit).[7]

We also present the results of the intervention on the whole distribution of outcomes.

[5] The signal-to-noise ratio, also known as communality, gives the amount of variance of each measure that can be explained by the underlying latent factor.

[6] Note that we identify the overall causal effect of the THPP+ intervention and not the causal effect of recovering from depression or of any individual component of the intervention (e.g., behavioral activation or group-based aspects).

[7] In Appendix Section E, we report p-values computed using randomization inference based on Young (2019) with the randomization permuted at the cluster level. We observe minimal changes in the p-values due to the randomization inference.

Figure 4 presents the estimated densities of the latent factors for control and the treatment clusters. To compare the CDFs of the two groups, we perform a Kolmogorov-Smirnov test with bootstrap.[8] Quantile treatment effects are reported in Appendix Figure A8.

3.1 Maternal Health

Treatment effects on maternal outcomes are reported in Table 2. Treated women experienced a significant reduction in depression scores (PHQ-9) at 6 and 36 months postpartum relative to women in the control clusters (p-values 0.014 and 0.001, respectively). They were less likely to have a major depression episode at 6, 12, and 36 months, with a reduction of likelihood ranging between 7 and 12 percentage points (p-values 0.011, 0.011, and 0.001, respectively). We observe positive and significant treatment effects across all indicators of maternal depression, stress and functioning throughout the trial period, except at the 24-month follow-up, where we find null, slightly negative, effects across all outcomes.[9]

Treatment effects on aggregate summary indices confirm the persistence of benefits of the treatment on maternal outcomes. Figures 2-3 present the adjusted beta coefficient plots of ICW indices and factor scores, respectively. We identify an improvement ranging between 0.14 and 0.33 standard deviations in the mental health (ICW) indices

[8]The null hypothesis is that two CDFs are the same. Bootstrapped p-values are reported at the upper left corner of each plot.

[9]As noted in Appendix B, there is evidence of differential attrition in the 24-month follow-up. Although this is unlikely to explain a null treatment effect, to investigate we estimated treatment effects using the fixed sample of 771 mothers who were present at all follow-up points (A16-A19). The treatment effects in this sample are similar to the treatment effects in the full sample, suggesting that the dip in treatment effects at 24 months is not an artifact of differential attrition. We also investigate whether the dip in the treatment effect at 24 months can be explained by differential fertility, differential shocks to treatment or control villages, or measurement error, and find that it cannot. The median birth spacing in our sample is 24 months, and the treatment has a marginal effect in reducing fertility (adjusted beta coefficient of -0.08, p-value$<$0.10) but flexibly controlling for post-treatment fertility choices does not change the treatment effect on maternal mental health. It does not seem that different shocks in the treated vs control villages occur at 24 months as we do not find any differences at this point in the mothers who were not depressed at baseline (who are not treated but live in the same villages as mothers in the intervention). Measurement error is an unlikely explanation because, looking at the estimated factor scores, the variance of the error term and the signal-to-noise ratios in the measurement system are similar across waves. We do find that the gap between the depressed controls and baseline non-depressed disappears for some outcomes at 24 months, suggesting the control group differentially experienced a positive shock in that wave.

and the factor scores, with the largest effect size observed at 36 months. Functioning at 36 months postpartum is also improved by treatment, by 0.22 SD in the maternal functioning (ICW) index and by 0.29 SD in factor score.

Plots of the outcome distributions show a rightward shift in the latent score for maternal mental health throughout the trial period. These effects are bigger in the lower half of the distribution, although not always statistically significant.

3.2 Child outcomes

The estimated treatment effects on child outcomes are generally noisier and smaller than on mothers. Still, we observe some significant improvements in the socioemotional and cognitive domains (Tables 3-4) among children of treated mothers. The total ASQ-SE score is lower (indicating better socioemotional skills) in the treatment group at 12 and 36 months. Looking at the sub-components of ASQ-SE shows that this benefit of treatment is driven by the significant improvement in the self-regulation domain, measuring the child's ability to regulate her emotions and adjust to new environments. At 12 months, the socioemotional factor score is 0.17 SD higher in the treatment group (p-value 0.008), and this effect is driven by male children. However, this does not persist, becoming small and imprecise at 36 months (0.06 SD)—so the intervention seems to have only a short-term benefit in this case.

The estimated treatment effect on the Bayley receptive domain score (one of the two components of Bayley-III measuring cognition) is significantly positive at 36 months, with a score increase of 0.390 (p-value 0.058) in the treatment group, which brings the mean scores of the treatment group up to the scores of the non-depressed group. However, treatment effects on the aggregate cognition index and factor score are small (0.09 and 0.05 SD, respectively) and imprecisely estimated. The observed effect on overall child development (ICW) indices is also minimal throughout the trial, ranging between -0.08 SD and 0.07 SD.

Looking at the distribution of outcomes, there is a shift to the right in the distribution

of children's socioemotional skills in the treatment group in the first 12 months of the trial. However, at 36 months, the two densities overlap again suggesting a short-term effect. Quantile treatment effect analysis yields larger effects in the lower half of the distribution in the first two years, which becomes insignificant at 36 months postpartum (Appendix Figure A8).

The distribution of the child cognition factor shows a scale shift at 12 months and a small location shift at 36 months postpartum. For children's physical health, the densities for the control and treatment groups overlap and the Kolmogorov-Smirnov test cannot reject that they are equal. Quantile treatment effects are also not generally different from zero in any part of these distributions, except for the higher positive effect on parental investment at 6 months on the lower part of the distribution up to the 40^{th} quantile.

3.3 Parental Investment and Parenting Behaviour

Looking at parental investment, the intervention improved most subscales of the HOME inventory indicating maternal responsivity, avoidance of restrictions and punishment, organization of the child's environment, and provision of appropriate learning materials at 12 months postpartum. Overall, the investment ICW index improved by 0.14 SD (p-value: 0.059) and the investment factor score increased by 0.08 SD (p-value: 0.344) at this point. The treatment effect on parenting of about 10% of a standard deviation, if more precisely estimated, is modest when compared to other global studies focusing on at-risk parents (Rayce et al., 2017; Jeong et al., 2021).

Looking at the endpoint of the intervention (36 months), we observe a positive treatment effect on summary indices (0.08 - 0.11 SD), though they are not precisely estimated. This suggests a possible fade-out of the benefits of the intervention towards the end of 36 months period.

3.4 Heterogeneity

Exploring treatment effect heterogeneity on maternal outcomes by gender of the index child reveals that the estimated benefits are mostly driven by the mothers of boys (Appendix Tables A22-A24 and appendix figures A4-A6).[10] This is not surprising given the documented son preference in South Asia (Sathar et al., 2015; Milazzo, 2018; Bhalotra et al., 2020). However, this result is opposite to the result in Baranov et al. (2020), who showed that a similar intervention (THP) run on a different sample of new mothers in rural Pakistan favored mothers of girls, especially in the long run. This difference in heterogeneity might be driven by intervention modality: THPP+ was peer-delivered, while THP was delivered by trained community health workers. Peers might implicitly reinforce gender norms, whereas lady health workers might act to empower mothers of girls.

3.5 Discussion

The group-based, peer-delivered psychosocial intervention that we analyze proves to be effective at improving maternal well-being by 15-20% of a standard deviation at 6, 12, and 36 months, albeit with a dip (non-detectable small negative effect) at 24 months. These improvements in well-being lead to a small and imprecisely estimated increase in parenting behavior of 5 to 15% of standard deviation, and to no sizeable change in children's short or long-term outcomes. The broad pattern of these results is in line with the findings from Baranov et al. (2020).

To provide a benchmark for the effectiveness of the intervention and to put the magnitude of the treatment effects in perspective, we can compare the adjusted beta coefficients with the mean level of the ICW indices for the mothers who were not depressed at baseline. Since the mean ICW index for the control group is standardized to be zero, the average outcome for the nondepressed mothers represents the association between

[10] We consider heterogeneity by gender and birth-order of the index child, as well as an asset-based index of socioeconomic status of the family and education of the mother. While other interaction terms are sometimes large and statistically significant, the pattern of results is not systematic for birth order, socio-economic status, or maternal education.

prenatal depression and outcomes. We call this descriptive statistic the "depression gap" and display this in Appendix Tables (A25-A26).

The intervention mostly narrowed depression gaps, tending to bring the medium-term outcomes of perinatally depressed women closer to the outcome of women who were in the same pregnancy cohort but not depressed at recruitment into the study. Importantly, the gap in child health and skills is often small and noisily estimated. As such, the treatment effects sometimes have a different sign, and sometimes a greater magnitude than the gap itself.

Our findings build upon Maselko et al. (2020), who reported the impacts of the THPP+ intervention only on a pre-registered set of maternal and child outcomes at 36 months postpartum, and control for a pre-specified set of variables.[11] For instance, Maselko et al. (2020) focus on *clinical* measures of depression (PHQ-9 score, depression remission, and major depressive episode)—while we construct a broader measure of maternal mental health. Focusing on a narrow set of pre-specified outcomes increases transparency and replicability, but might hinder our ability to learn systematically from the data (Coffman and Niederle, 2015).

We extend the analysis in that paper in the following ways. We investigate dynamics, exploring multiple indicators and their evolution throughout the study period. This more granular approach allows us to track outcomes through different stages of child development. At each stage, we estimate treatment effects by gender of the child and on the distribution of outcomes rather than only at the mean. We provide treatment effects on a broader set of outcomes (including, for instance, the ASQ-SE for socioemotional development). We use aggregate summary indices to provide summary measures of maternal well-being and child development and to improve statistical power.

[11] Specifically, Maselko et al. (2020) included as control only variables that were imbalanced by treatment-arm at baseline, or predicted missingness at 36 months at the $p<0.10$ level, following common practice in the health literature. The current analysis includes a broader set of covariates, and their interaction with the treatment indicator, in particular baseline PHQ-9, WHODAS, and PSS scores, which are significantly imbalanced at baseline when considered jointly, but not individually. The inclusion of baseline mental health measures drives the differences in point estimates between the findings in Maselko et al. (2020) and this paper.

Focusing on a broader definition of mental health as captured by the indices, we do find a sizeable and statistically significant improvement of 0.33 of a standard deviation in maternal mental health at 36 months: the intervention still proves to be beneficial in the medium term. Our estimates indicate that stopping the follow-up of this cohort earlier would have inadvertently led to a more pessimistic conclusion about the long-lasting effect of the intervention on maternal mental health.

The more substantive departure of this paper from our earlier work is the attempt to put some structure on the dynamic evolution of child skills, accounting for the differential evolution of maternal mental health and parenting in the treatment vs control groups. We discuss this next.

4 Mechanisms: Technology of Skill Formation

We now discuss how, following Cunha and Heckman (2008); Attanasio et al. (2020a), we impose a simplifying structure on the dynamic evolution of the child's latent human capital. The purpose is to better summarize and synthesize the multifaceted relationship between maternal mental health, parenting, and the evolution of child development across its three domains, and how these relationships are potentially influenced by the intervention. While models of this sort tend to rely upon courageous assumptions, they can be helpful in providing an overarching structure that binds together into an intuitive framework many of the reduced form results described above. We specify the following production function for child development.

$$\theta_{t+1} = f(\theta_t, I_{t+1}, \mathbf{P_t}, X, \eta; \mathbf{d}) \tag{4}$$

θ_t and θ_{t+1} are vectors for child skills at time t and $t+1$ respectively. I_{t+1} stands for parental investment, which occurs between the realizations of θ_t and θ_{t+1}[12]. P_t is

[12]We use I_{t+1} instead of I_t as an input in the production function to capture investments that accumulated up until t+1. As parental investment is a flow variable and our indicators for investment mostly measure material investment (e.g., whether the index child has certain toys), I_{t+1} is more relevant in the production of θ_{t+1}

maternal mental health and functioning at time t which we conceptualize as a capital input, X contains baseline covariates measured before the treatment assignment and η is the vector of random shocks to child development. $d = 0$ indicates the control group and $d = 1$ indicates the treatment group. To proxy for the latent traits θ_t, P_t, and I_{t+1}, we construct factor scores similar to the ones described in Section 2.3.2 but this time leveraging the dynamic nature of the data and jointly estimating the latent factors for each domain (physical health, socio-emotional, and cognitive) pooling all time periods. This procedure simultaneously addresses the problems of measurement error, identification, location, and scale.

We contribute to the literature in two related ways. First, we include in the model two *dynamic* latent factors measuring maternal mental health and functioning P_t. Their measurement is consistent over time and uses state-of-the-art instruments for the screening and assessment of three relevant conditions—depression, stress, and disability. We estimate their contribution to the production function of the child's cognitive, socioemotional, and physical health. Earlier related studies at best include a time-invariant measure of maternal characteristics such as cognitive skills, physical health, or noncognitive skills (Cunha and Heckman, 2008; Cunha et al., 2010; Attanasio et al., 2022b). To distinguish maternal mental health from parental investments, we conceptualize it as capital in the production function, similar in principle to the conceptualization of physical health as capital (Grossman, 1972).

Second, this study is the first to estimate how a psychosocial intervention targeting the mother might influence the production function of children's skills, allowing $f(;d)$ to vary with the intervention d. Similar to a Kitagawa-Oaxaca-Blinder decomposition (Kitagawa, 1955), we allow the intervention to act through two potential mechanisms: a change in the level of parental inputs; and a change in the returns to inputs, i.e. the efficiency with which the inputs translate into child outcomes.

We provide illustrative examples of the channels through which the intervention may influence the outcomes. First, it may increase inputs such as parental investments, for

example by encouraging mothers to spend more time with their children or to invest in new toys and learning materials.[13] Second, the intervention may also alter the production function, and influence the way that inputs translate into outputs. For example, even holding the quantity of inputs constant, the intervention may increase the productivity of each unit of time spent with the child by improving maternal focus and empathy, or by inducing a more age-appropriate use of time and physical resources.

For ease of interpretation and estimation, we assume that the production function for child socioemotional and physical health, cognition, and parental investment is log-linear (Cobb Douglas).[14]

$$\begin{aligned}\ln(\theta^k_{idt+1}) = A^k_d + \gamma^k_1 \ln(\theta^H_{it}) + \gamma^k_2 \ln(\theta^S_{it}) + \gamma^k_3 \ln(\theta^C_{it}) + \gamma^k_4 \ln(P^C_i) + \gamma^k_{5d} \ln(P^{MH}_{it}) \\ + \gamma^k_6 \ln(P^F_{it}) + \gamma^k_{7d} \ln(I_{it+1}) + \gamma^k_8 X_i + \eta^k_{it} \\ k \in \{H, S, C\}\end{aligned} \tag{5}$$

$$\begin{aligned}\ln I_{idt+1} = \lambda_{0d} + \lambda_1 \ln(\theta^H_{it}) + \lambda_2 \ln(\theta^S_{it}) + \lambda_3 \ln(\theta^C_{it}) + \lambda_4 \ln(P^C_i) + \lambda_{5d} \ln(P^{MH}_{it}) \\ + \lambda_6 \ln(P^F_{it}) + \lambda_7 X_i + u_{it}\end{aligned} \tag{6}$$

where H, S, and C stand for physical health, socioemotional skills, and cognition of the child, respectively. Eq. (5) reflects that children's health and cognition in period $t+1$ $\{\theta^H_{it+1}, \theta^S_{it+1}, \theta^C_{it+1}\}$ are functions of the previous period stock of skills and health $\{\theta^S_{it}, \theta^H_{it}, \theta^C_{it}\}$, investments made by parents up to that point $\{I_{it+1}\}$, parental education, as well as maternal mental health and functioning $\{P^C_i, P^{MH}_{it}, P^F_{it}\}$. X_i denotes the same baseline covariates used in the treatment effect estimation in Section 3, notably the mother's baseline age, weight, height, waist circumference and blood pressure, family

[13] This is demonstrated in Baranov et al. (2020); Angelucci and Bennett (2021), and more likely with this intervention, which directly encouraged mothers to engage with and stimulate the child.

[14] Freyberger (2020) shows that an erroneous normalization or misspecification of the latent factor structure might lead to biased estimates, especially in the case of non-linear production functions such as CES.

structure, grandmother being resident, total adults in the household, people per room, number of children (split by gender), whether the index child is the first child, asset-based SES index and child gender.[15] A_d^k stands for total factor productivity (TFP) and η_{it}^k represents unobserved shocks to child development. Eq.(6) relates the stock of child and parent abilities to parental investment. The same control variables are included as in Eq.(5).

While all of the distributions of latent factors are allowed to be different across treatment, control, and baseline nondepressed mothers, we only allow the coefficients of A_d^k, P_{it}^{MH} and I_{it+1} to vary with treatment status (d). This simplifying assumption focuses the estimation on the two main channels that were targeted by the intervention: maternal mental health and investments. It allows us to study how the productivity of maternal mental health and investments changes as a function of the intervention.

We estimate the production and investment functions in equations (5) and (6) in two stages: at 12 months and at 36 months. To do so, we use the factor scores resulting from the measurement system discussed above. As a longitudinal comparison of latent variables requires normalization of the factors on the same measure over time and we have a completely different set of measures available for parental investment at this time point, we exclude 24 months. Also, we exclude the lagged cognition in the estimations for 12 months, as we do not have any cognitive measures available at 6 months. Tables 6-7 report the estimates for the outcomes at 12 months and 36 months respectively.

The results provide the following key insights. The estimates reveal that children's skills are highly persistent over time, indicating 'self-productivity' in skills. A high level of socioemotional skills today is strongly predictive of strong socioemotional skills in the future. This finding is consistent with, for instance, Bufferd et al. (2012),

[15] As a robustness check, we also include in the controls the baseline level of mental health during pregnancy, $P_{i,0}^{MH}$, to capture the idea that pregnancy might be a critical developmental window in terms of exposure to depression, and to test for potential departures from the simple Markov dynamics as suggested by Attanasio et al. (2020b). Results in Appendix Tables A27-A28 show that the results do not change sizeably once baseline depression is added as a control.

though their evidence is for persistence from age 3 to 6 years, while we contribute evidence from 6 months to 3 years. We find that self-productivity is actually stronger earlier in childhood. On the other hand, skills are not very predictive across domains—the 'cross-productivity' of skills in this sample is low (except that cognitive skill development is predicted by greater physical health at both 12 and 36 months).

Now consider the associations of maternal and child variables in the control group—the sample of women who were depressed during pregnancy and received no intervention (top panel). Maternal mental health in the control group is an important contributor to child development and parental investment. The relationship between maternal mental health and child development is stronger when the child is younger, while the relationship with investments in children is larger when the child is older.

Variation in maternal mental health within the sample of non-depressed mothers plays a less prominent role—the interaction term between maternal mental health and the non-depressed sample is negative in the earlier period and close to zero in the later period. This confirms the intuition that small changes in mental health among women diagnosed as depressed are more likely to influence child development than small variations within a sample of women who are not depressed.

The estimates for the control group show that parental investment at 36 months is related to the cognitive and socioemotional development of children, but parental investment at 12 months has no predictive power for developmental outcomes. On the other hand, parental investment among mothers who were not depressed at baseline is highly predictive of cognitive development even in the earlier period, at 12 months.

The descriptive associations discussed so far suggest that a dynamic measure of maternal mental health is an important input in the technology of skill formation, and that it might constitute an omitted variable in previous studies. Given the relevance of maternal mental health and functioning for child development, an intervention targeting maternal depression might place children on a higher developmental trajectory.

Now consider the effect of the intervention on the production function. The intervention creates significant shifts at 12 months, while having no discernible impact at 36 months. For outcomes measured at 12 months of age, we observe that the intervention raises the productivity of parental investments in socioemotional and cognitive development. However, it attenuates the relationship of maternal mental health with child development in early childhood.

These findings suggest a possible explanation for the lack of results of the intervention on children's skills: the increase in maternal mental health induced by the intervention is muted by a lower productivity of the mental health input in the production function. Although the level of the input increases, its rate of return decreases, leading to a negligible change in child development.

The coefficients on the interaction with the treatment group indicator often, if not always, take the same sign and show a similar magnitude as the coefficients on the interactions with the indicator for women who were not depressed at baseline. This suggests that the intervention bridges the "depression gap" in the production function, morphing the technology of skill formation for depressed mothers to look more like that for women who did not suffer depression during pregnancy.

Finally, mirroring our reduced form analysis of treatment effects and following recent trends in the literature focusing on socioemotional skills and mental health (Moroni et al., 2019), we split the sample by gender and estimate the technology of skill formation separately for boys and girls. Appendix Tables A29-A30 suggest that the influence of the intervention on the production function of skills seems to be stronger in girls, although statistical power is limited for such comparison.

5 Conclusion

We studied the impacts of a psychosocial intervention delivered to women diagnosed as depressed in pregnancy, starting in the third trimester of pregnancy and continu-

ing till the child was 36 months of age. We find that the intervention led to a large and sustained improvement in maternal mental health and functioning, to some increase in parental investment, though this is imprecisely estimated, and, despite these improvements, to no discernible improvements in indicators of child development.

To understand the associations of the multiple endogenous variables and the dynamics more clearly, we estimated a production function for child skills. Among women diagnosed as depressed in pregnancy but untreated (the control group), mental health is strongly related to child outcomes in early childhood and to investments in children in later childhood. These relations are economically significant: for example, they tend to be larger in magnitude than the associations between socio-economic status and child skill development.

This result among perinatally depressed mothers suggests that an intervention targeting maternal mental health and parenting behaviors might improve children's future skills. However, this does not seem to be the case. The potential reason behind the lack of effects on skills is that the intervention seems to mute the relationship between maternal mental health and children's outcomes. Just as in the sample of non-depressed mothers, the rate of return of mental health in the production function is close to zero for the treatment group. Therefore, the increase in mental health induced by the intervention is annihilated by a reduction in its efficiency in producing children's skills.
Overall, both the reduced form and the production function estimates suggest that the intervention is effective and tends to move outcomes for perinatally depressed women and their children towards outcomes for those who were not depressed during pregnancy.

Bibliography

Agostinelli, F. and Wiswall, M. (2016). Identification of dynamic latent factor models: The implications of re-normalization in a model of child development. Technical report, National Bureau of Economic Research.

Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the abecedarian, perry preschool, and early training projects. *Journal of the American statistical Association*, 103(484):1481–1495.

Angelucci, M. and Bennett, D. (2021). The Economic Impact of Depression Treatment in India. *IZA DP No. 14393*.

Anger, S. (2012). From parents to children: The intergenerational transmission of advantage, chapter intergenerational transmission of cognitive and noncognitive skills. *Russell Sage Foundation*, 3(14):5.

Attanasio, O., Cattan, S., Fitzsimons, E., Meghir, C., and Rubio-Codina, M. (2020a). Estimating the production function for human capital: results from a randomized controlled trial in colombia. *American Economic Review*, 110(1):48–85.

Attanasio, O., de Paula, Á., and Toppeta, A. (2020b). The persistence of socio-emotional skills: Life cycle and intergenerational evidence.

Attanasio, O., de Paula, Á., and Toppeta, A. (2022a). Intergenerational mobility in socio-emotional skills. *Working Paper*.

Attanasio, O., Meghir, C., and Nix, E. (2020c). Human capital development and parental investment in india. *The Review of Economic Studies*, 87(6):2511–2541.

Attanasio, O. P., Cattan, S., and Meghir, C. (2022b). Early Childhood Development, Human Capital, and Poverty. *Annual Review of Economics*, 14(1).

Baranov, V., Bhalotra, S., Biroli, P., and Maselko, J. (2020). Maternal Depression, Women's Empowerment, and Parental Investment: Evidence from a Randomized Controlled Trial. *American Economic Review*, 110(3):824–859.

Bennett, I. M., Schott, W., Krutikova, S., and Behrman, J. R. (2016). Maternal mental health, and child growth and development, in four low-income and middle-income countries. *J Epidemiol Community Health*, 70(2):168–173.

Bhalotra, S., Chakravarty, A., and Gulesci, S. (2020). The price of gold: Dowry and death in india. *Journal of Development Economics*, 143:102413.

Briggs-Gowan, M. J. and Carter, A. S. (2008). Social-emotional screening status in early childhood predicts elementary school outcomes. *Pediatrics*, 121(5):957–962.

Bufferd, S. J., Dougherty, L. R., Carlson, G. A., Rose, S., and Klein, D. N. (2012). Psychiatric disorders in preschoolers: continuity from ages 3 to 6. *American Journal of Psychiatry*, 169(11):1157–1164.

Class, Q. A., Van Hulle, C. A., Rathouz, P. J., Applegate, B., Zald, D. H., and Lahey, B. B. (2019). Socioemotional dispositions of children and adolescents predict general and specific second-order factors of psychopathology in early adulthood: A 12-year prospective study. *Journal of abnormal psychology*, 128(6):574.

Coffman, L. C. and Niederle, M. (2015). Pre-analysis plans have limited upside, especially where replications are feasible. *Journal of Economic Perspectives*, 29(3):81–98.

Cunha, F. and Heckman, J. J. (2008). Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. *Journal of human resources*, 43(4):738–782.

Cunha, F., Heckman, J. J., and Schennach, S. M. (2010). Estimating the technology of cognitive and noncognitive skill formation. *Econometrica*, 78(3):883–931.

Currie, J. and Stabile, M. (2006). Child mental health and human capital accumulation: The case of ADHD. *Journal of Health Economics*, 25(6):1094–1118.

de Quidt, J. and Haushofer, J. (2018). Depression through the Lens of Economics: A Research Agenda. *NBER Volume: The Economics of Poverty Traps*, pages 1–35.

Dohmen, T., Falk, A., Huffman, D., and Sunde, U. (2012). The intergenerational transmission of risk and trust attitudes. *The Review of Economic Studies*, 79(2):645–677.

Feil, E. G., Walker, H. M., and Severson, H. H. (1995). The Early Screening Project for young children with behavior problems. *Journal of Emotional and Behavioral Disorders*, 3:194–202.

Freyberger, J. (2020). Normalizations and misspecification in skill formation models. *Working Paper*.

Grönqvist, E., Öckert, B., and Vlachos, J. (2017). The intergenerational transmission of cognitive and noncognitive abilities. *Journal of Human Resources*, 52(4):887–918.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, 80(2):223–255.

Groves, M. O. (2005). Personality and the intergenerational transmission of economic status. *Unequal chances: Family background and economic success*, pages 208–231.

Halfon, N., Larson, K., Lu, M., Tullis, E., and Russ, S. (2014). Lifecourse health development: past, present and future. *Maternal and child health journal*, 18(2):344–365.

Heckman, J. J., Humphries, J. E., and Kautz, T. (2014). *The Myth of Achievement Tests*. University of Chicago Press. Publication Title: The Myth of Achievement Tests.

Heckman, J. J. and Rubinstein, Y. (2001). The importance of noncognitive skills: Lessons from the GED testing program. *American Economic Review*, 91(2):145–149.

Herba, C. M., Glover, V., Ramchandani, P. G., and Rondon, M. B. (2016). Maternal depression and mental health in early childhood: an examination of underlying mechanisms in low-income and middle-income countries. *The Lancet Psychiatry*, 3(10):983–992.

Jeong, J., Franchett, E. E., Oliveira, C. V. R. d., Rehmani, K., and Yousafzai, A. K. (2021). Parenting interventions to promote early child development in the first three years of life: A global systematic review and meta-analysis. *PLOS Medicine*, 18(5):e1003602.

Kitagawa, E. M. (1955). Components of a Difference Between Two Rates. *Journal of the American Statistical Association*, 50(272):1168.

Kling, J. R., Liebman, J. B., and Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, 75(1):83–119.

Loehlin, J. C. (2005). Resemblance in personality and attitudes between parents and their children. *Unequal chances: Family background and economic success*, pages 192–207.

Maselko, J., Sikander, S., Turner, E. L., Bates, L. M., Ahmad, I., Atif, N., Baranov, V., Bhalotra, S., Bibi, A., Bibi, T., Bilal, S., Biroli, P., Chung, E., Gallis, J. A., Hagaman, A., Jamil, A., LeMasters, K., O'Donnell, K., Scherer, E., Sharif, M., Waqas, A., Zaidi, A., Zulfiqar, S., and Rahman, A. (2020). Effectiveness of a peer-delivered, psychosocial intervention on maternal depression and child development at 3 years postnatal: a cluster randomised trial in Pakistan. *The Lancet Psychiatry*, 7(9):775–787.

Milazzo, A. (2018). Why are adult women missing? son preference and maternal survival in india. *Journal of Development Economics*, 134:467–484.

Moroni, G., Nicoletti, C., and Tominey, E. (2019). Child Socio-Emotional Skills: The Role of Parental Inputs.

Nangle, D., Erdley, C., and Schwartz-Mette, R. (2020). *Social Skills Across the Life Span*, volume 1. Academic Press.

National Scientific Council on the Developing Child (2012). *Establishing a level foundation for life: Mental health begins in early childhood*. Harvard University, Center on the Developing Child.

O'hara, M. W. and Swain, A. M. (1996). Rates and risk of postpartum depression—a meta-analysis. *International review of psychiatry*, 8(1):37–54.

O'Connor, K. M. and Hayes, B. (2020). How effective are targeted interventions for

externalizing behavior when delivered in primary schools? *International Journal of School & Educational Psychology*, 8(3):161–173.

Parsons, C. E., Young, K. S., Rochat, T. J., Kringelbach, M. L., and Stein, A. (2012). Postnatal depression and its effects on child development: a review of evidence from low-and middle-income countries. *British medical bulletin*, 101(1):57–79.

Rahman, A., Malik, A., Sikander, S., Roberts, C., and Creed, F. (2008). Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural pakistan: a cluster-randomised controlled trial. *Lancet*, 372(9642):902–9.

Rayce, S. B., Rasmussen, I. S., Klest, S. K., Patras, J., and Pontoppidan, M. (2017). Effects of parenting interventions for at-risk parents with infants: a systematic review and meta-analyses. *BMJ Open*, 7(12):e015707.

Sathar, Z., Rashida, G., Hussain, S., and Hassan, A. (2015). Evidence of son preference and resulting demographic and health outcomes in pakistan. *Islamabad Population Council*.

Sikander, S., Ahmad, I., Atif, N., Zaidi, A., Vanobberghen, F., Weiss, H. A., Nisar, A., Tabana, H., Ain, Q. U., Bibi, A., et al. (2019a). Delivering the thinking healthy programme for perinatal depression through volunteer peers: a cluster randomised controlled trial in pakistan. *The Lancet Psychiatry*, 6(2):128–139.

Sikander, S., Ahmad, I., Bates, L. M., Gallis, J., Hagaman, A., O'Donnell, K., Turner, E. L., Zaidi, A., Rahman, A., and Maselko, J. (2019b). Cohort profile: Perinatal depression and child socioemotional development; the bachpan cohort study from rural pakistan. *BMJ open*, 9(5):e025644.

Sikander, S., Lazarus, A., Bangash, O., Fuhr, D. C., Weobong, B., Krishna, R. N., Ahmad, I., Weiss, H. A., Price, L., Rahman, A., et al. (2015). The effectiveness and cost-effectiveness of the peer-delivered thinking healthy programme for perinatal

depression in pakistan and india: the share study protocol for randomised controlled trials. *Trials*, 16(1):534.

Spearman, C. (1904). 'general intelligence,' objectively determined and measured. *The American Journal of Psychology*, 15:201–293.

Sprague, J. and Walker, H. (2000). Early Identification and Intervention for Youth with Antisocial and Violent Behavior. *Exceptional Children*, 66(3):367–379.

Turner, E. L., Sikander, S., Bangash, O., Zaidi, A., Bates, L., Gallis, J., Ganga, N., O'Donnell, K., Rahman, A., and Maselko, J. (2016). The effectiveness of the peer delivered thinking healthy plus (thpp+) programme for maternal depression and child socio-emotional development in pakistan: study protocol for a three-year cluster randomized controlled trial. *Trials*, 17(1):442.

Young, A. (2019). Channeling fisher: Randomization tests and the statistical insignificance of seemingly significant experimental results. *The Quarterly Journal of Economics*, 134(2):557–598.

Table 1: Baseline Balance

	Baseline Sample (N=1154)								6-months (N=929)		12-months (N=940)		24-months (N=903)		36-months (N=889)	
	Control		Treatment	Nondep.	Diff.	p-val	Diff.	p-val	Diff.	p-val	Diff.	p-val	Diff.	p-val	Diff.	p-val
	Mean	SD	Mean	Mean	(ND-D)		(T-C)		(T-C)		(T-C)		(T-C)		(T-C)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Mother's Age	27.289	4.973	26.802	26.373	-0.674	0.023	-0.487	0.260	-0.595	0.215	-0.361	0.434	-0.310	0.510	-0.314	0.478
Mother's height (cm)	156.330	6.088	157.429	157.105	0.230	0.545	1.100	0.074	0.996	0.145	1.043	0.109	1.352	0.031	1.023	0.131
Mother's weight (kg)	61.241	12.883	60.172	59.887	-0.823	0.186	-1.070	0.359	-1.205	0.325	-0.861	0.476	-1.065	0.432	-1.286	0.385
Mother's waist circ. (in)	37.555	4.088	36.852	37.134	-0.071	0.746	-0.704	0.115	-0.793	0.068	-0.628	0.421	-0.843	0.075	-0.688	0.176
Mother's blood pressure	72.326	12.790	70.915	71.667	0.043	0.950	-1.411	0.173	-0.352	0.723	-1.169	0.263	-0.339	0.748	-1.049	0.308
PHQ total	14.484	3.580	14.894	2.796	-11.891	0.000	0.410	0.248	0.400	0.305	0.484	0.227	0.364	0.362	0.380	0.347
WHODAS total	16.111	9.119	16.714	5.613	-10.798	0.000	0.602	0.475	0.600	0.513	0.814	0.376	0.999	0.291	0.809	0.423
PSS total	22.899	7.523	23.841	12.212	-11.154	0.000	0.942	0.100	1.311	0.036	1.113	0.072	1.216	0.062	1.020	0.151
Joint/extended family	0.634	0.483	0.580	0.707	0.100	0.000	-0.055	0.175	-0.058	0.228	-0.049	0.321	-0.060	0.206	-0.075	0.096
Grandmother present	0.666	0.473	0.629	0.717	0.070	0.005	-0.037	0.331	-0.028	0.504	-0.029	0.473	-0.043	0.329	-0.034	0.434
Total adults in the hh	5.700	2.993	5.332	5.985	0.467	0.011	-0.368	0.201	-0.320	0.334	-0.325	0.316	-0.212	0.527	-0.281	0.402
People per room	2.473	1.870	2.792	2.215	-0.416	0.001	0.319	0.087	0.325	0.078	0.348	0.056	0.322	0.066	0.316	0.097
Number of girls	0.854	1.064	0.958	0.663	-0.243	0.000	0.104	0.328	0.071	0.120	0.090	0.433	0.124	0.308	0.051	0.655
Number of boys	0.787	0.961	0.855	0.560	-0.261	0.000	0.068	0.443	0.002	0.987	0.023	0.817	0.037	0.705	0.039	0.700
First child	0.251	0.434	0.230	0.363	0.123	0.000	-0.021	0.506	-0.002	0.951	0.005	0.869	-0.012	0.709	-0.023	0.468
SES asset index	-0.320	1.688	-0.560	0.422	0.861	0.000	-0.240	0.152	-0.133	0.201	-0.130	0.489	-0.161	0.398	-0.169	0.359
Mother's education	6.801	4.546	6.827	8.567	1.753	0.000	0.025	0.957	0.376	0.428	0.311	0.537	0.087	0.863	0.096	0.849
Father's education	8.331	3.288	7.848	9.151	1.059	0.000	-0.483	0.134	-0.560	0.117	-0.609	0.102	-0.844	0.026	-0.750	0.037
Life Events Checklist	4.098	2.335	4.696	2.896	-1.499	0.000	0.599	0.003	0.673	0.001	0.599	0.003	0.648	0.001	0.590	0.003
Observations	287		283	584												
Joint test (p-value)								0.011		0.028		0.053		0.018		0.141

Note: Table tests for balance for the baseline characteristics. Columns 1,3 and 4 show the mean in the control, treatment and nondepressed group in the baseline sample, respectively. Column 5 shows the difference in means between nondepressed and depressed group. Column 7, 9, 11, 13 and 15 show the mean differences between treatment and control group in the baseline sample and 6 months, 12 months, 24 months and 36 months follow-up samples, respectively. p-values at the bottom of the table comes from the F-test of overall significance from a regression of the treatment dummy on all the baseline controls.

Table 2: Trajectory of Maternal Measures

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val	N
	Mean	SD	Mean	Mean	(T-C)	Beta			
6 Months									
PHQ Total	6.842	6.263	6.074	3.159	-0.768	-1.116	0.452	0.014	929
PHQ Categorized									929
Minimal (0-4)	0.447	0.498	0.491	0.732	0.044	0.060	0.037	0.106	929
Mild (5-9)	0.241	0.429	0.265	0.180	0.024	0.035	0.034	0.301	929
Moderate (10-14)	0.149	0.357	0.122	0.049	-0.027	-0.042	0.035	0.228	929
Moderately Severe (15-19)	0.127	0.334	0.087	0.032	-0.054	-0.050	0.024	0.041	929
Severe (20+)	0.035	0.184	0.035	0.006	0.000	-0.003	0.011	0.752	929
PSS Total	17.219	9.369	15.887	11.270	-1.332	-1.520	0.648	0.019	929
Current Major Dep. Episode	0.225	0.418	0.179	0.060	-0.046	-0.071	0.028	0.011	926
Remission	0.447	0.498	0.491		0.044	0.060	0.037	0.106	458
Recovery	0.452	0.499	0.583		0.131	0.128	0.036	0.000	458
Mental Health Index	**0**	**1**	**0.142**	**0.516**	**0.142**	**0.205**	**0.056**	**0.000**	929
Mental Health Factor	**0**	**1**	**0.161**	**0.647**	**0.161**	**0.206**	**0.052**	**0.000**	929
Whodas Total	7.623	9.420	6.683	2.943	-0.940	-1.652	0.807	0.041	926
Functioning Index	**0**	**1**	**0.136**	**0.459**	**0.136**	**0.184**	**0.079**	**0.019**	929
Functioning Factor	**0**	**1**	**0.108**	**0.543**	**0.108**	**0.181**	**0.075**	**0.016**	929
Mother Index	**0**	**1**	**0.168**	**0.531**	**0.168**	**0.211**	**0.061**	**0.001**	929
12 Months									
PSS Total	17.724	9.534	17.309	12.031	-0.414	-1.169	0.743	0.116	940
Current Major Dep. Episode	0.303	0.460	0.256	0.101	-0.047	-0.091	0.036	0.011	938
Mental Health Index	**0**	**1**	**0.103**	**0.478**	**0.103**	**0.135**	**0.067**	**0.044**	940
Mental Health Factor	**0**	**1**	**0.095**	**0.642**	**0.095**	**0.170**	**0.053**	**0.001**	940
Whodas Total	7.175	9.008	5.843	3.333	-1.332	-1.878	0.731	0.010	940
Functioning Index	**0**	**1**	**0.192**	**0.378**	**0.192**	**0.248**	**0.059**	**0.000**	940
Functioning Factor	**0**	**1**	**0.157**	**0.469**	**0.157**	**0.196**	**0.069**	**0.005**	940
Mother Index	**0**	**1**	**0.165**	**0.457**	**0.164**	**0.214**	**0.071**	**0.002**	940
24 Months									
PHQ Total	6.782	6.152	6.829	3.951	0.047	0.052	0.478	0.913	903
PHQ Categorized									903
Minimal (0-4)	0.445	0.498	0.424	0.666	-0.022	-0.025	0.034	0.458	903
Mild (5-9)	0.291	0.455	0.333	0.218	0.042	0.028	0.034	0.414	903
Moderate (10-14)	0.141	0.349	0.129	0.072	-0.012	-0.001	0.029	0.966	903
Moderately Severe (15-19)	0.064	0.245	0.057	0.027	-0.006	0.005	0.020	0.792	903
Severe (20+)	0.059	0.236	0.057	0.017	-0.002	-0.007	0.017	0.692	903
PSS Total	14.027	8.257	15.724	10.645	1.697	1.129	0.633	0.075	903
Current Major Dep. Episode	0.251	0.435	0.254	0.106	0.002	0.012	0.033	0.713	900
Mental Health Index	**0**	**1**	**-0.139**	**0.328**	**-0.139**	**-0.033**	**0.051**	**0.515**	903
Mental Health Factor	**0**	**1**	**0.028**	**0.532**	**0.028**	**-0.002**	**0.057**	**0.970**	903
Whodas Total	7.532	8.476	7.757	4.230	0.225	0.503	0.648	0.437	903
Functioning Index	**0**	**1**	**-0.087**	**0.303**	**-0.087**	**-0.095**	**0.077**	**0.219**	903
Functioning Factor	**0**	**1**	**-0.013**	**0.406**	**-0.013**	**-0.036**	**0.072**	**0.616**	903
Mother Index	**0**	**1**	**-0.170**	**0.302**	**-0.170**	**-0.071**	**0.061**	**0.240**	903
36 Months									
PHQ Total	6.481	6.254	5.845	3.441	-0.637	-1.737	0.505	0.001	889
PHQ Categorized									889
Minimal (0-4)	0.509	0.501	0.534	0.730	0.025	0.071	0.039	0.067	889
Mild (5-9)	0.241	0.429	0.218	0.139	-0.024	-0.022	0.030	0.458	889
Moderate (10-14)	0.097	0.297	0.150	0.090	0.053	0.061	0.021	0.004	889
Moderately Severe (15-19)	0.106	0.309	0.068	0.034	-0.039	-0.056	0.021	0.009	889
Severe (20+)	0.046	0.211	0.029	0.006	-0.017	-0.055	0.019	0.004	889
PSS Total	14.931	9.731	13.971	9.857	-0.960	-2.855	0.885	0.001	889
GAD Total	5.542	6.437	4.644	3.028	-0.899	-2.571	0.632	0.000	623
GAD Total $>$ 10	0.165	0.372	0.113	0.070	-0.052	-0.089	0.038	0.019	623
Current Major Dep. Episode	0.213	0.410	0.160	-0.102	0.043	-0.119	0.035	0.001	889
Mental Health Index	**0**	**1**	**0.168**	**0.425**	**0.168**	**0.325**	**0.090**	**0.000**	889
Mental Health Factor	**0**	**1**	**0.134**	**0.553**	**0.134**	**0.267**	**0.077**	**0.001**	889
Whodas Total	6.778	9.444	5.874	3.338	-0.904	-2.790	0.867	0.001	889
Functioning Index	**0**	**1**	**0.066**	**0.317**	**0.066**	**0.220**	**0.074**	**0.003**	889
Functioning Factor	**0**	**1**	**0.118**	**0.377**	**0.118**	**0.287**	**0.080**	**0.000**	889
Mother Index	**0**	**1**	**0.128**	**0.372**	**0.128**	**0.291**	**0.092**	**0.001**	889

Note: Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with the (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (splitted by gender), whether the index child is the first child, parental education (in years), asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Functioning Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available. Remission: Proportion of depressed at baseline having PHQ Total$<$5 at 3 or 6 months. Recovery: Proportion of depressed at baseline having PHQ Total$<$5 at 3 and 6 months.

Table 3: Trajectory of Child Measures I

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val	N
	Mean	SD	Mean	Mean	(T-C)	Beta			
6 Months									
Weight for age z-score	-0.857	1.140	-0.903	-0.892	-0.046	-0.140	0.123	0.254	923
Height for age z-score	0.086	1.688	0.278	0.053	0.192	0.063	0.177	0.720	920
Head Circ. for age z-score	-0.809	1.044	-0.882	-0.813	-0.073	-0.133	0.099	0.178	923
Child Health Index	**0**	**1**	**0.001**	**-0.020**	**0.001**	**-0.055**	**0.067**	**0.419**	929
Child Health Factor	**0**	**1**	**-0.020**	**-0.015**	**-0.020**	**-0.011**	**0.073**	**0.878**	929
ASQ Total	9.512	13.247	9.977	9.302	0.465	0.045	1.217	0.971	852
ASQ Self-regulation	3.902	6.906	3.848	3.930	-0.055	-0.507	0.600	0.398	852
ASQ Communication	0.366	1.711	0.461	0.547	0.095	0.061	0.196	0.757	852
ASQ Adaptive Func.	3.805	6.275	4.078	3.651	0.273	0.579	0.521	0.266	852
ASQ Affect	0.415	1.839	0.691	0.442	0.277	0.407	0.169	0.016	852
ASQ Interaction	0.829	2.581	0.599	0.477	-0.230	-0.636	0.237	0.007	852
Child SE Index	**0**	**1**	**-0.034**	**0.041**	**-0.034**	**-0.049**	**0.073**	**0.495**	852
Child SE Factor	**0**	**1**	**0.050**	**-0.028**	**0.050**	**0.076**	**0.057**	**0.187**	852
Child Index	**0**	**1**	**-0.028**	**0.033**	**-0.028**	**-0.067**	**0.073**	**0.357**	929
12 Months									
Weight for age z-score	-0.795	1.128	-0.751	-0.769	0.044	0.208	0.122	0.088	934
Height for age z-score	-0.782	1.312	-0.713	-0.784	0.069	0.119	0.108	0.273	934
Head Circ. for age z-score	-0.849	1.000	-0.951	-0.911	-0.102	-0.110	0.095	0.247	938
Child Health Index	**0**	**1**	**0.012**	**-0.016**	**0.012**	**-0.031**	**0.063**	**0.623**	940
Child Health Factor	**0**	**1**	**0.047**	**0.064**	**0.047**	**0.015**	**0.067**	**0.824**	940
ASQ Total	11.689	13.958	9.731	10.112	-1.958	-1.795	1.002	0.073	940
ASQ Self-regulation	5.022	8.799	3.655	4.427	-1.367	-1.633	0.604	0.007	940
ASQ Communication	0.504	2.117	0.717	0.450	0.213	0.474	0.205	0.021	940
ASQ Adaptive Func.	5.219	6.240	4.596	4.233	-0.623	-0.450	0.415	0.278	940
ASQ Affect	0.307	1.452	0.224	0.368	-0.083	0.026	0.120	0.827	940
ASQ Interaction	0.439	1.825	0.359	0.317	-0.080	-0.143	0.117	0.219	940
Child SE Index	**0**	**1**	**0.106**	**0.050**	**0.106**	**0.105**	**0.057**	**0.064**	940
Child SE Factor	**0**	**1**	**0.157**	**0.111**	**0.157**	**0.165**	**0.062**	**0.008**	940
Bayley Cognitive (scaled)	9.196	2.249	9.276	9.430	0.081	0.022	0.182	0.904	923
Bayley Receptive (scaled)	7.942	1.373	7.949	7.969	0.007	-0.141	0.111	0.205	923
Bayley Expressive (scaled)	9.076	1.634	8.954	9.212	-0.122	-0.145	0.154	0.346	923
Bayley Fine motor (scaled)	9.036	1.724	8.908	9.012	-0.128	-0.265	0.170	0.118	923
Bayley Gross motor (scaled)	8.209	2.217	8.120	8.096	-0.089	0.065	0.221	0.768	923
Child Cog Index	**0**	**1**	**-0.038**	**0.038**	**-0.038**	**-0.050**	**0.070**	**0.471**	940
Child Cog Factor	**0**	**1**	**-0.064**	**0.064**	**-0.064**	**-0.084**	**0.083**	**0.309**	940
Child Index	**0**	**1**	**0.096**	**0.051**	**0.096**	**0.069**	**0.050**	**0.169**	940

Note: SE=socioemotional skills. Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Physical Health Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available.

Table 4: Trajectory of Child Measures II

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val	N
	Mean	SD	Mean	Mean	(T-C)	Beta			
24 Months									
Weight for age z-score	-0.911	1.045	-1.003	-0.847	-0.092	-0.058	0.077	0.453	895
Height for age z-score	-1.149	1.183	-1.133	-1.045	0.017	-0.007	0.099	0.941	900
Head Circ. for age z-score	-0.852	0.875	-0.975	-0.964	-0.123	-0.166	0.083	0.044	901
Child Health Index	**0**	**1**	**-0.097**	**0.004**	**-0.097**	**-0.082**	**0.077**	**0.290**	903
Child Health Factor	**0**	**1**	**-0.130**	**0.053**	**-0.130**	**-0.100**	**0.083**	**0.227**	903
ASQ Total	12.237	23.633	13.900	15.764	1.662	1.232	1.346	0.360	899
ASQ Self-regulation	2.591	5.623	2.738	2.717	0.147	0.144	0.334	0.667	903
ASQ Compliance	0.182	1.339	0.286	0.486	0.104	0.112	0.104	0.284	903
ASQ Communication	0.841	4.065	0.833	1.438	-0.008	0.028	0.245	0.910	903
ASQ Adaptive Func.	1.250	3.046	1.286	1.522	0.036	-0.166	0.201	0.408	903
ASQ Autonomy	0.250	1.528	0.381	0.581	0.131	0.122	0.097	0.211	903
ASQ Affect	0.932	3.533	0.952	1.353	0.021	-0.026	0.283	0.925	903
ASQ Interaction	5.982	9.841	7.225	7.516	1.243	1.150	0.615	0.061	899
Child SE Index	**0**	**1**	**-0.043**	**-0.162**	**-0.043**	**0.054**	**0.071**	**0.453**	903
Child SE Factor	**0**	**1**	**-0.050**	**-0.217**	**-0.050**	**-0.065**	**0.067**	**0.334**	903
Child Index	**0**	**1**	**-0.071**	**-0.128**	**-0.071**	**0.030**	**0.074**	**0.681**	903
36 Months									
Weight for age z-score	-0.951	1.030	-1.056	-0.939	-0.105	-0.160	0.098	0.101	881
Height for age z-score	-0.846	1.012	-0.925	-0.778	-0.079	-0.176	0.123	0.152	885
Child Health Index	**0**	**1**	**-0.099**	**0.045**	**-0.099**	**-0.120**	**0.090**	**0.182**	889
Child Health Factor	**0**	**1**	**-0.120**	**0.040**	**-0.120**	**-0.167**	**0.081**	**0.038**	889
ASQ Total	41.181	19.526	41.189	38.576	0.009	-1.450	1.637	0.376	889
ASQ Self-regulation	19.630	10.120	18.689	17.944	-0.940	-1.321	0.732	0.071	889
ASQ Compliance	0.602	2.071	0.728	0.685	0.126	0.136	0.196	0.486	889
ASQ Communication	0.741	2.294	0.947	0.642	0.206	-0.117	0.260	0.653	889
ASQ Adaptive Func.	2.940	4.874	3.617	3.062	0.677	0.312	0.623	0.616	889
ASQ Autonomy	10.069	2.872	9.515	9.839	-0.555	-0.382	0.207	0.065	889
ASQ Affect	0.810	3.150	0.801	0.450	-0.009	-0.223	0.380	0.557	889
ASQ Interaction	6.389	5.491	6.893	5.953	0.504	0.143	0.275	0.603	889
SDQ Total	14.718	6.127	14.733	13.687	0.015	0.262	0.331	0.428	889
Boi Total	18.617	11.174	18.124	20.021	-0.493	0.291	0.357	0.415	889
Child SE Index	**0**	**1**	**-0.022**	**0.240**	**-0.022**	**0.012**	**0.076**	**0.875**	889
Child SE Factor	**0**	**1**	**0.025**	**0.147**	**0.025**	**0.059**	**0.102**	**0.565**	889
Bayley Receptive (scaled)	9.977	2.600	10.417	10.413	0.440	0.390	0.206	0.058	886
Bayley Fine motor (scaled)	11.377	4.117	11.422	11.308	0.045	0.041	0.286	0.885	886
Child Cog Index	**0**	**1**	**0.092**	**0.074**	**0.092**	**0.090**	**0.074**	**0.225**	889
Child Cog Factor	**0**	**1**	**0.036**	**-0.030**	**0.036**	**0.049**	**0.076**	**0.520**	889
Child Index	**0**	**1**	**-0.034**	**0.242**	**-0.034**	**-0.005**	**0.079**	**0.953**	889

Note: SE=socioemotional skills. Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Physical Health Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available.

Table 5: Trajectory of Parental Investment

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val	N
	Mean	SD	Mean	Mean	(T-C)	Beta			
6 Months									
MPAS Total	86.354	6.146	86.166	87.397	-0.188	0.302	0.624	0.629	929
MSES Total	36.886	3.710	37.265	37.726	0.379	0.229	0.264	0.387	929
Investment Index	**0**	**1**	**0.083**	**0.180**	**0.083**	**0.095**	**0.065**	**0.145**	929
Investment Factor	**0**	**1**	**0.060**	**0.417**	**0.060**	**0.076**	**0.057**	**0.187**	929
12 Months									
HOME Total	30.680	5.683	31.099	32.419	0.419	0.639	0.499	0.200	940
HOME Responsivity	9.732	1.434	9.865	9.787	0.133	0.226	0.114	0.047	940
HOME Acceptance	6.088	1.389	6.224	6.192	0.136	0.152	0.126	0.226	940
HOME Organization	3.434	1.417	3.556	3.775	0.122	0.153	0.142	0.281	940
HOME Learning Mat.	4.728	2.643	4.798	5.487	0.070	0.176	0.256	0.493	940
HOME Involvement	3.886	1.453	3.892	4.264	0.006	0.001	0.128	0.995	940
HOME Variety	2.811	0.582	2.762	2.914	-0.049	-0.069	0.066	0.298	940
Investment Index	**0**	**1**	**0.131**	**0.262**	**0.131**	**0.142**	**0.075**	**0.059**	940
Investment Factor	**0**	**1**	**0.062**	**0.447**	**0.062**	**0.080**	**0.084**	**0.344**	940
24 Months									
OMCI Total	37.374	4.641	37.074	38.161	-0.267	-0.146	0.409	0.721	885
Investment Index	**0**	**1**	**-0.076**	**0.166**	**-0.076**	**-0.045**	**0.084**	**0.592**	889
Investment Factor	**0**	**1**	**0.012**	**0.035**	**0.012**	**-0.031**	**0.083**	**0.710**	889
36 Months									
HOME Total	37.347	4.494	37.607	38.582	0.260	0.279	0.366	0.446	889
HOME Responsivity	10.472	0.899	10.437	10.497	-0.035	-0.040	0.065	0.535	889
HOME Acceptance	6.759	1.204	6.898	6.919	0.139	0.173	0.095	0.068	889
HOME Organization	5.028	0.935	5.049	5.148	0.021	-0.002	0.075	0.982	889
HOME Learning Mat.	6.435	2.451	6.505	7.004	0.070	0.134	0.222	0.546	889
HOME Involvement	5.065	1.303	5.121	5.313	0.057	0.039	0.090	0.665	889
HOME Variety	3.588	0.847	3.597	3.702	0.009	-0.025	0.052	0.625	889
OMCI Total	40.958	3.992	41.362	41.353	0.403	0.261	0.390	0.503	886
Investment Index	**0**	**1**	**0.060**	**0.179**	**0.060**	**0.079**	**0.071**	**0.264**	889
Investment Factor	**0**	**1**	**0.070**	**0.365**	**0.070**	**0.113**	**0.077**	**0.143**	889

Note: MPAS : Maternal Postnatal Attachment Scale, MSES : Maternal Self-Efficacy Scale, OMCI: Observation for Mother Child Interaction. Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with the (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Investment Index : all MPAS items +all MSES items at 6 months, all HOME items at 12 and 36 months, all OMCI items at 24 months.

Figure 2: Coefficient Plots of Indices

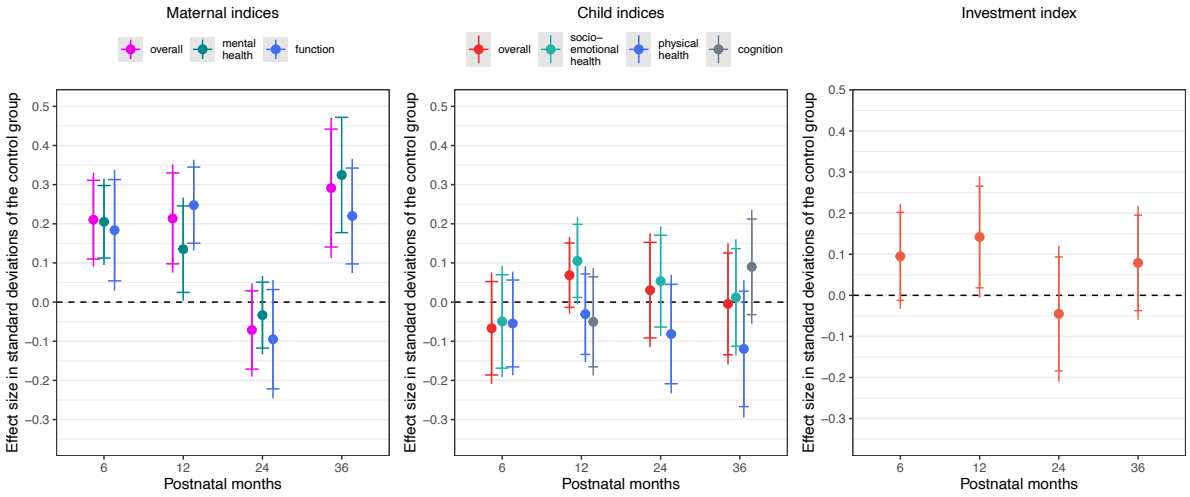


Figure 3: Coefficient Plots of Factors

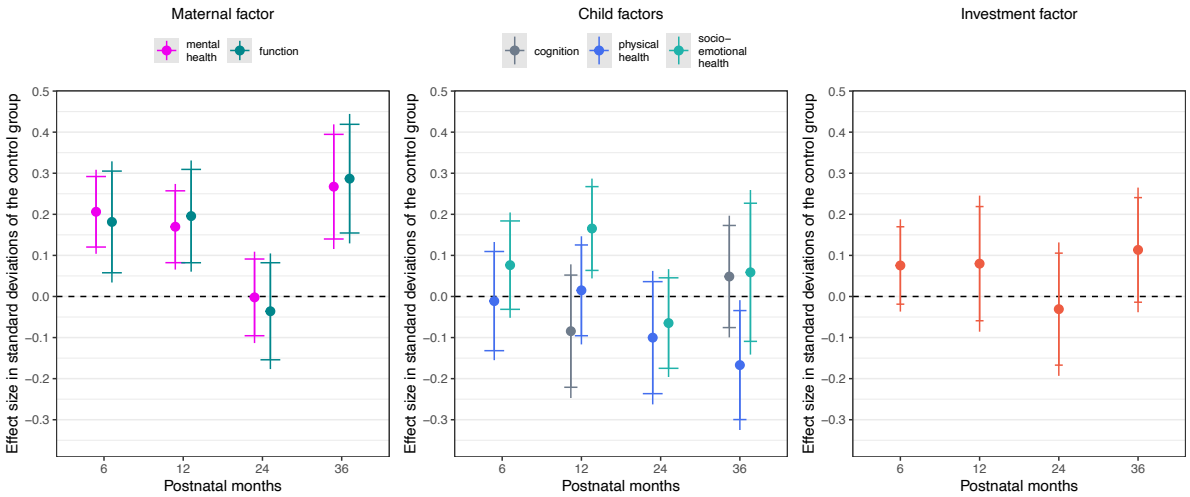
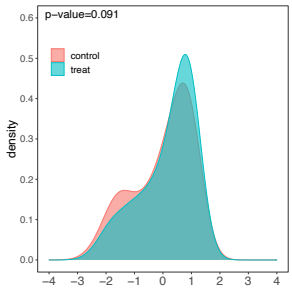
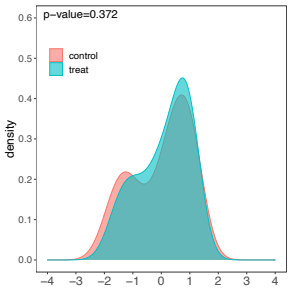


Figure 4: Kernel Densities of Latent Factors

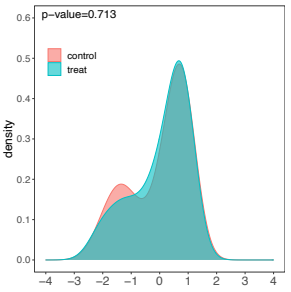
(a) Maternal mental health, 6 months



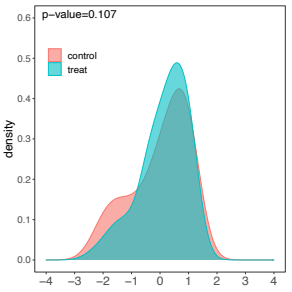
(b) Maternal mental health, 12 months



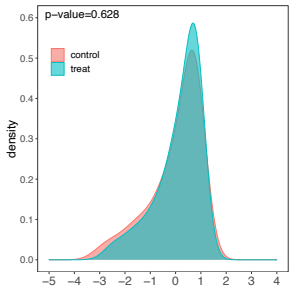
(c) Maternal mental health, 24 months



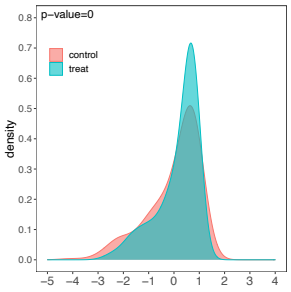
(d) Maternal mental health, 36 months



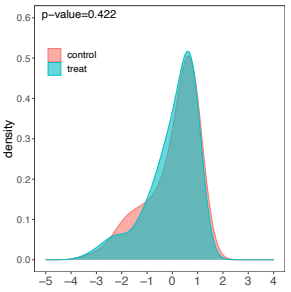
(e) Maternal func., 6 months



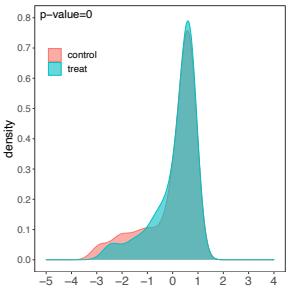
(f) Maternal func., 12 months



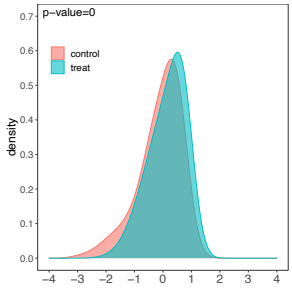
(g) Maternal func., 24 months



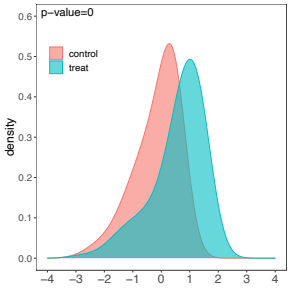
(h) Maternal func., 36 months



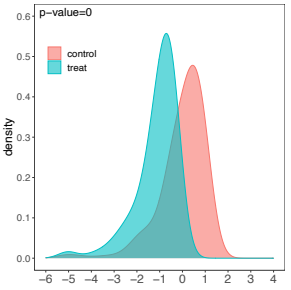
(i) Children's socioemotional skills, 6 months



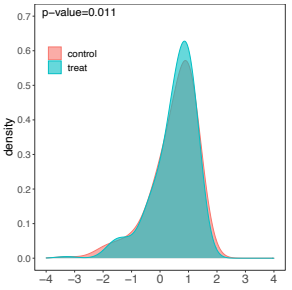
(j) Children's socioemotional skills, 12 months



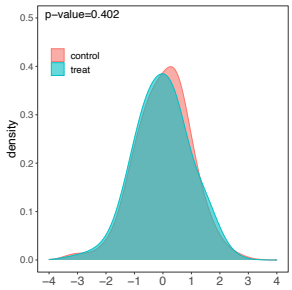
(k) Children's socioemotional skills, 24 months



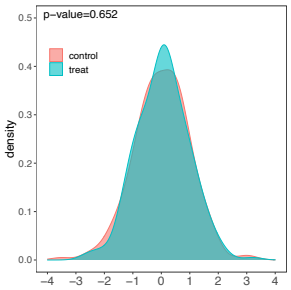
(l) Children's socioemotional skills, 36 months



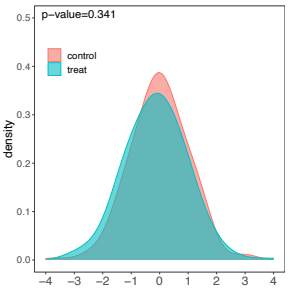
(m) Children's physical health, 6 months



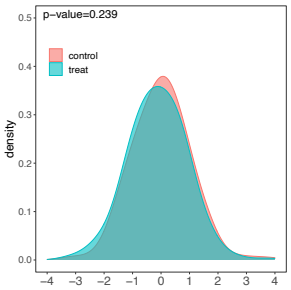
(n) Children's physical health, 12 months



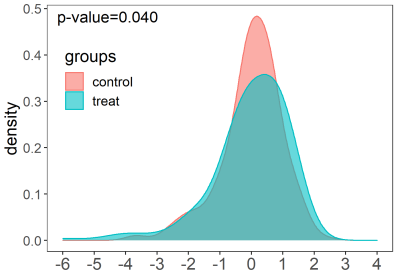
(o) Children's physical health, 24 months



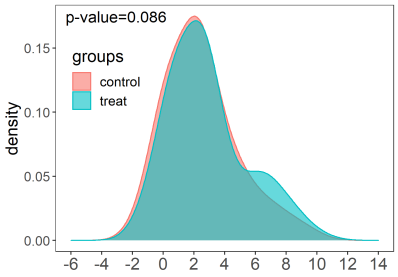
(p) Children's physical health, 36 months



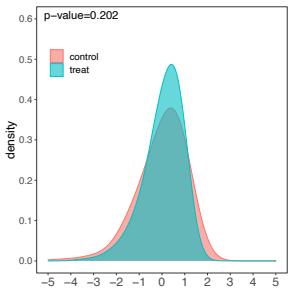
(q) Children's cognition, 12 months



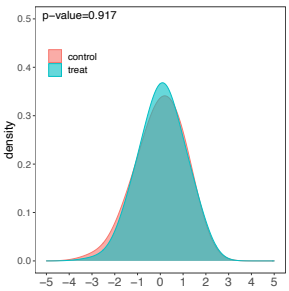
(r) Children's cognition, 36 months



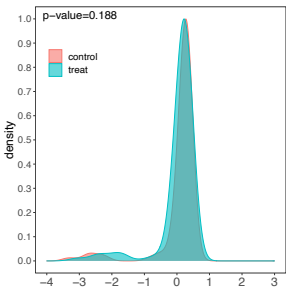
(s) Parental investment, 6 months



(t) Parental investment, 12 months



(u) Parental investment, 24 months



(v) Parental investment, 36 months

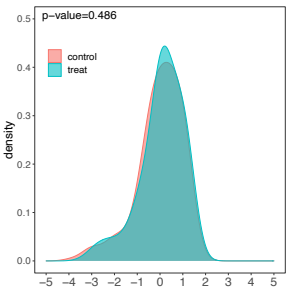


Table 6: Estimates of the Production Function and Investment Equations I

	Socioemotional skills (12m)	Physical health (12m)	Cognition (12m)	Parental investment (12m)
	(1)	(2)	(3)	(4)
SE skills (6m)	0.541***	0.001	0.060*	0.046
	(0.047)	(0.013)	(0.034)	(0.028)
physical health (6m)	0.044	0.928***	0.109***	0.077***
	(0.037)	(0.014)	(0.042)	(0.024)
mother mental health (6m)	0.119*	0.079***	0.136*	−0.104
	(0.062)	(0.030)	(0.074)	(0.069)
mother functioning (6m)	−0.043	−0.044**	−0.023	0.082*
	(0.053)	(0.020)	(0.044)	(0.043)
investment (12m)	0.051	0.030	−0.012	
	(0.081)	(0.022)	(0.059)	
Interactions				
mother MH (6m) x treat	−0.217***	−0.060	−0.198**	0.113
	(0.079)	(0.038)	(0.093)	(0.083)
mother MH (6m) x nondep.	−0.059	−0.133***	−0.064	0.121
	(0.098)	(0.035)	(0.094)	(0.080)
investment (12m) x treat	0.107	−0.027	0.339***	
	(0.106)	(0.035)	(0.091)	
investment (12m) x nondep.	−0.008	−0.023	0.199***	
	(0.084)	(0.030)	(0.073)	
Total factor productivity (TFP)				
TFP	−0.567	−0.516	4.291***	0.593
	(0.887)	(0.329)	(0.943)	(0.823)
TFP x treat	0.480***	0.036*	−0.030	0.051
	(0.060)	(0.021)	(0.057)	(0.061)
TFP x nondep.	0.283***	0.075***	−0.007	0.131**
	(0.060)	(0.021)	(0.045)	(0.056)
Baseline controls				
SES assets	−0.016	0.004	0.009	0.093***
	(0.020)	(0.007)	(0.024)	(0.016)
mother's education (years)	−0.003	0.005	−0.004	0.019***
	(0.006)	(0.003)	(0.007)	(0.004)
husband's education (years)	0.001	−0.006**	−0.002	0.016**
	(0.007)	(0.003)	(0.006)	(0.007)
Observations	932	932	927	932
R2	0.503	0.881	0.256	0.373
Adjusted R2	0.468	0.873	0.203	0.331

SE= socioemotional skills, MH=mental health. Dependent variables are child outcomes and parental investment factors at 12 months postpartum. Independent variables include an indicator of treatment status (control, treatment, nondepressed), child and maternal factors at 6 months, parental investment factor at 12 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.
Note: *p<0.1; **p<0.05; ***p<0.01

Table 7: Estimates of the Production Function and Investment Equations II

	Socioemotional skills (36m)	Physical health (36m)	Cognition (36m)	Parental investment (36m)
	(1)	(2)	(3)	(4)
SE skills (12m)	0.242***	0.035*	0.013	−0.084***
	(0.036)	(0.019)	(0.023)	(0.032)
physical health (12m)	0.029	1.049***	0.049**	0.064**
	(0.041)	(0.026)	(0.023)	(0.029)
cognition (12m)	−0.004	−0.018	0.056**	0.032
	(0.037)	(0.022)	(0.022)	(0.033)
mother mental health (12m)	0.080	0.040	−0.070	0.200***
	(0.096)	(0.050)	(0.058)	(0.075)
mother functioning (12m)	−0.073	−0.049*	0.054*	−0.007
	(0.050)	(0.027)	(0.031)	(0.049)
investment (36m)	0.161**	0.001	0.090**	
	(0.069)	(0.039)	(0.040)	
Interactions				
mother MH (12m) x treat	0.052	−0.056	0.059	−0.154*
	(0.112)	(0.057)	(0.063)	(0.085)
mother MH (12m) x nondep.	0.005	0.003	−0.007	−0.077
	(0.112)	(0.046)	(0.067)	(0.088)
investment (36m) x treat	−0.184*	0.038	−0.084	
	(0.109)	(0.054)	(0.059)	
investment (36m) x nondep.	0.016	−0.048	−0.005	
	(0.100)	(0.045)	(0.050)	
Total factor productivity (TFP)				
TFP	0.625	−1.584**	1.868**	1.793
	(2.452)	(0.713)	(0.910)	(1.290)
TFP x treat	−0.116	−0.169***	0.021	0.133**
	(0.084)	(0.045)	(0.042)	(0.059)
TFP x nondep.	−0.174***	−0.004	−0.048	0.103
	(0.067)	(0.039)	(0.037)	(0.065)
Baseline controls				
SES assets	−0.014	−0.004	−0.001	0.053***
	(0.015)	(0.012)	(0.011)	(0.019)
mother's education (years)	−0.006	0.006	0.013***	0.016***
	(0.006)	(0.004)	(0.004)	(0.005)
husband's education (years)	0.009	−0.003	0.008	0.031***
	(0.007)	(0.004)	(0.006)	(0.008)
Observations	881	881	881	881
R2	0.422	0.838	0.297	0.312
Adjusted R2	0.384	0.828	0.251	0.269

SE= socioemotional skills, MH=mental health. Dependent variables are child outcomes and parental investment factors at 36 months postpartum. Independent variables include an indicator of treatment status (control, treatment, nondepressed), child and maternal factors at 12 months, parental investment factor at 36 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.

Note: *p<0.1; **p<0.05; ***p<0.01

Appendix

A Measures of Child Development, Parental Background and Investment

The following table provides the full list of measurements for child development, parental skills investment and baseline household characteristics that we were initially interested in.

Latent Factor	Measurements	Baseline	3 months	6 months	12 months	24 months	36 months
Child's Socioemotional Skills (θ_t^S) and (θ_{t+1}^S)	Ages and Stages Questionnaire (ASQ-SE) : all items	NA	NA	✓	✓	✓	✓
	Strengths and Difficulties Questionnaire (SDQ) : all items	NA	NA	NA	NA	NA	✓
Child's Physical Health (θ_t^H) and (θ_{t+1}^H)	Child's weight for age Z-score	NA	✓	✓	✓	✓	✓
	Child's height for age Z-score	NA	✓	✓	✓	✓	✓
	Child's Head Circumference for age Z-score	NA	✓	✓	✓	✓	NA
Child's Cognition (θ_t^C) and (θ_{t+1}^C)	Bayley Scales of Infant Development: Fine Motor	NA	NA	NA	✓	NA	✓
	Bayley Scales of Infant Development: Gross Motor	NA	NA	NA	✓	NA	NA
	Bayley Scales of Infant Development: Cognitive	NA	NA	NA	✓	NA	NA
	Bayley Scales of Infant Development: Expressive	NA	NA	NA	✓	NA	NA
	Bayley Scales of Infant Development: Receptive	NA	NA	NA	✓	NA	✓
Parents' Education at Baseline (P_t^C)	Number of years the mother spent in education	✓	NA	NA	NA	NA	NA
	Number of years the father spent in education	✓	NA	NA	NA	NA	NA
Mothers' Mental Health (P_t^{MH})	Patient Health Questionnaire (PHQ - 9): all items	✓	✓	✓	NA	✓	✓
	Structured Clinical Interview for the DSM (SCID) : all items	✓	✓	✓	✓	✓	✓
	Cohen Perceived Stress Scale (PSS): all items	✓	✓	✓	✓	✓	✓
Mothers' Functioning (P_t^{PH})	WHO Disability Assessment Schedule (WHO-DAS): all items	✓	✓	✓	✓	✓	✓
Parental Investment (I_t) and (I_{t+1})	HOME:Learning Material Subscale	NA	✓	NA	✓	NA	✓
	HOME:Responsivity Subscale	NA	✓	NA	✓	NA	✓
	HOME:Acceptance Subscale	NA	✓	NA	✓	NA	✓
	HOME:Organization Subscale	NA	✓	NA	✓	NA	✓
	HOME:Involvement Subscale	NA	✓	NA	✓	NA	✓
	HOME:Variety Subscale	NA	✓	NA	✓	NA	✓
	Observation of Mother-Child Interaction	NA	NA	NA	NA	✓	✓

Table A1: Possible Measures for Child Development, Parental Background and Investment

B Balance and Attrition

Table A2: Characteristics of Attritors at 6 months

	Attritor characteristics				Attritor characteristics by treatment arm			
	Sample mean	Attritor mean	Diff. (2)-(1)	p-val	Attritor T mean	Attritor C mean	Diff. T-C	p-val
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's age	26.617	27.076	0.459	0.208	26.906	26.966	-0.060	0.949
Mother's height (cm)	157.012	156.909	-0.103	0.832	157.323	155.834	1.489	0.214
Mother's weight (kg)	60.378	59.945	-0.434	0.513	58.711	59.417	-0.706	0.737
Mother's waist circ. (in)	37.217	36.976	-0.240	0.393	36.225	36.651	-0.426	0.593
Mother's blood pressure	71.242	73.312	2.071	0.041	69.604	75.220	-5.617	0.036
PHQ total	8.671	8.667	-0.004	0.995	15.094	14.627	0.467	0.483
WHODAS total	10.861	11.298	0.437	0.613	17.302	16.627	0.675	0.709
PSS total	17.670	17.938	0.268	0.705	23.075	23.644	-0.569	0.707
Joint/extended family	0.665	0.627	-0.039	0.340	0.491	0.542	-0.052	0.566
Grandmother present	0.700	0.613	-0.086	0.058	0.472	0.559	-0.088	0.447
Total adults in the hh	5.742	5.804	0.063	0.769	4.792	5.407	-0.614	0.337
People per room	2.348	2.721	0.373	0.012	3.077	2.749	0.328	0.481
Number of girls	0.776	0.809	0.033	0.699	1.075	0.831	0.245	0.227
Number of boys	0.688	0.693	0.005	0.923	1.057	0.712	0.345	0.033
First child	0.292	0.347	0.055	0.074	0.226	0.322	-0.096	0.196
SES asset index	0.041	-0.186	-0.227	0.097	-1.155	-0.440	-0.715	0.011
Mother's education	7.792	7.324	-0.468	0.145	5.547	7.017	-1.470	0.105
Father's education	8.643	8.564	-0.078	0.740	7.679	7.881	-0.202	0.758
Life Events Checklist	3.632	3.653	0.021	0.899	4.377	4.102	0.276	0.623
Observations	929	225	1154		53	59	112	
Joint test (p-value)								0.138

Note: Table shows baseline characteristics and their differences for women who were lost to 6 months follow-up. Columns 1-4 compare the 6 months follow-up sample to attritors at 6 months. Columns 5-8 compares the baseline characteristics of attritors at 6 months by treatment arm. p-value at the bottom of the table comes from the F-test that jointly tests all coefficients with the null hypothesis of attritors in the treatment and control groups being balanced.

Table A3: Characteristics of Attritors at 12 months

	Attritor characteristics				Attritor characteristics by treatment arm			
	Sample mean	Attritor mean	Diff. (2)-(1)	p-val	Attritor T mean	Attritor C mean	Diff. T-C	p-val
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's age	26.719	26.650	-0.070	0.850	26.267	27.220	-0.954	0.298
Mother's height (cm)	157.035	156.804	-0.231	0.618	156.948	155.608	1.340	0.214
Mother's weight (kg)	60.442	59.642	-0.800	0.238	57.970	59.758	-1.788	0.422
Mother's waist circ. (in)	37.224	36.931	-0.293	0.315	36.083	37.051	-0.968	0.285
Mother's blood pressure	71.449	72.512	1.063	0.324	70.817	73.153	-2.336	0.386
PHQ total	8.478	9.514	1.036	0.034	14.983	14.864	0.119	0.857
WHODAS total	10.714	11.967	1.253	0.214	16.750	16.966	-0.216	0.905
PSS total	17.589	18.304	0.714	0.305	23.367	23.068	0.299	0.831
Joint/extended family	0.653	0.678	0.024	0.445	0.550	0.627	-0.077	0.317
Grandmother present	0.694	0.636	-0.058	0.166	0.517	0.576	-0.060	0.560
Total adults in the hh	5.747	5.785	0.038	0.866	5.167	5.695	-0.528	0.376
People per room	2.360	2.686	0.326	0.046	3.025	2.824	0.201	0.672
Number of girls	0.762	0.874	0.112	0.178	1.100	0.949	0.151	0.424
Number of boys	0.699	0.645	-0.054	0.414	0.933	0.695	0.238	0.178
First child	0.293	0.346	0.053	0.188	0.217	0.339	-0.122	0.154
SES asset index	0.025	-0.131	-0.156	0.240	-0.917	-0.267	-0.650	0.024
Mother's education	7.737	7.542	-0.195	0.578	6.183	7.237	-1.054	0.209
Father's education	8.643	8.561	-0.082	0.734	7.967	7.966	0.001	0.999
Life Events Checklist	3.629	3.668	0.040	0.833	4.567	3.966	0.601	0.275
Observations	940	214	1154		60	59	119	
Joint test (p-value)								0.498

Note: Table shows baseline characteristics and their differences for women who were lost to 12 months follow-up. Columns 1-4 compare the 12 months follow-up sample to attritors at 12 months. Columns 5-8 compares the baseline characteristics of attritors at 12 months by treatment arm. p-value at the bottom of the table comes from the F-test that jointly tests all coefficients with the null hypothesis of attritors in the treatment and control groups being balanced.

Table A4: Characteristics of Attritors at 24 months

	Attritor characteristics				Attritor characteristics by treatment arm			
	Sample mean	**Attritor mean**	**Diff. (2)-(1)**	**p-val**	**Attritor T mean**	**Attritor C mean**	**Diff. T-C**	**p-val**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's age	26.638	26.952	0.314	0.411	26.562	27.597	-1.035	0.308
Mother's height (cm)	157.120	156.530	-0.591	0.196	156.705	156.331	0.374	0.744
Mother's weight (kg)	60.489	59.592	-0.897	0.246	58.074	58.863	-0.789	0.684
Mother's waist circ. (in)	37.262	36.838	-0.424	0.180	36.332	36.504	-0.173	0.828
Mother's blood pressure	71.411	72.488	1.077	0.360	69.699	74.433	-4.734	0.085
PHQ total	8.373	9.737	1.364	0.007	15.425	14.940	0.484	0.439
WHODAS total	10.647	12.024	1.377	0.082	16.219	16.851	-0.632	0.704
PSS total	17.435	18.753	1.318	0.058	23.534	23.448	0.086	0.947
Joint/extended family	0.661	0.645	-0.016	0.603	0.548	0.582	-0.034	0.676
Grandmother present	0.695	0.637	-0.058	0.111	0.562	0.567	-0.006	0.954
Total adults in the hh	5.728	5.849	0.121	0.565	5.014	5.851	-0.837	0.139
People per room	2.311	2.815	0.504	0.002	3.054	2.811	0.242	0.603
Number of girls	0.753	0.888	0.135	0.057	1.014	0.985	0.029	0.884
Number of boys	0.687	0.697	0.011	0.866	0.945	0.791	0.154	0.335
First child	0.297	0.323	0.026	0.483	0.233	0.284	-0.051	0.555
SES asset index	0.033	-0.135	-0.168	0.187	-0.788	-0.321	-0.466	0.086
Mother's education	7.746	7.538	-0.209	0.507	6.863	7.045	-0.182	0.833
Father's education	8.731	8.255	-0.476	0.056	7.890	7.194	0.696	0.290
Life Events Checklist	3.579	3.841	0.261	0.132	4.548	4.090	0.458	0.364
Observations	903	251	1154		73	67	140	
Joint test (p-value)								0.046

Note: Table shows baseline characteristics and their differences for women who were lost to 24 months follow-up. Columns 1-4 compare the 24 months follow-up sample (including nondepressed arm) to attritors at 24 months. Columns 5-8 compares the baseline characteristics of attritors at 24 months by treatment arm. p-value at the bottom of the table comes from the F-test that jointly tests all coefficients with the null hypothesis of attritors in the treatment and control groups being balanced.

Table A5: Characteristics of Attritors at 36 months

	Attritor characteristics				Attritor characteristics by treatment arm			
	Sample mean	**Attritor mean**	**Diff. (2)-(1)**	**p-val**	**Attritor T mean**	**Attritor C mean**	**Diff. T-C**	**p-val**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's age	26.669	26.830	0.161	0.640	26.468	27.437	-0.969	0.317
Mother's height (cm)	157.047	156.806	-0.242	0.658	157.260	155.903	1.357	0.229
Mother's weight (kg)	60.582	59.325	-1.257	0.064	58.739	58.955	-0.216	0.911
Mother's waist circ. (in)	37.262	36.862	-0.400	0.155	36.304	36.980	-0.676	0.350
Mother's blood pressure	71.504	72.121	0.617	0.573	70.532	72.986	-2.453	0.344
PHQ total	8.379	9.645	1.266	0.007	15.130	14.662	0.468	0.446
WHODAS total	10.714	11.725	1.010	0.160	16.299	16.268	0.031	0.982
PSS total	17.553	18.287	0.733	0.310	23.325	22.549	0.775	0.548
Joint/extended family	0.666	0.630	-0.036	0.278	0.571	0.563	0.008	0.919
Grandmother present	0.697	0.634	-0.063	0.094	0.558	0.592	-0.033	0.691
Total adults in the hh	5.763	5.725	-0.038	0.865	5.078	5.676	-0.598	0.304
People per room	2.353	2.647	0.294	0.041	3.013	2.715	0.298	0.443
Number of girls	0.759	0.860	0.101	0.133	1.104	0.859	0.245	0.181
Number of boys	0.701	0.649	-0.052	0.428	0.883	0.732	0.151	0.331
First child	0.290	0.343	0.053	0.115	0.273	0.296	-0.023	0.784
SES asset index	0.038	-0.144	-0.182	0.164	-0.862	-0.449	-0.413	0.159
Mother's education	7.738	7.577	-0.161	0.536	6.714	6.887	-0.173	0.808
Father's education	8.682	8.445	-0.236	0.266	7.948	7.634	0.314	0.600
Life Events Checklist	3.620	3.691	0.071	0.659	4.558	3.915	0.643	0.163
Observations	889	265	1154		77	71	148	
Joint test (p-value)								0.652

Note: Table shows baseline characteristics and their differences for women who were lost to 36 months follow-up. Columns 1-4 compare the 36 months follow-up sample (including nondepressed arm) to attritors at 36 months. Columns 5-8 compares the baseline characteristics of attritors at 36 months by treatment arm. p-value at the bottom of the table comes from the F-test that jointly tests all coefficients with the null hypothesis of attritors in the treatment and control groups being balanced.

Table A6: Baseline Balance By Gender

	Baseline Sample: Boys (N=511)						Baseline Sample: Girls (N=503)					
	Control		T	ND	Diff	p-val	Control		T	ND	Diff	p-val
	Mean	SD	Mean	Mean	T-C		Mean	SD	Mean	Mean	T-C	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mother's age	27.339	5.240	27.118	26.126	-0.221	0.762	27.279	4.495	26.460	26.424	-0.819	0.100
Mother's height (cm)	156.407	6.714	157.678	157.018	1.271	0.138	156.633	5.662	157.527	157.070	0.894	0.281
Mother's weight (kg)	61.214	13.604	61.152	59.524	-0.062	0.973	62.139	12.189	59.698	59.972	-2.441	0.139
Mother's waist circ. (in)	37.601	3.975	36.949	37.067	-0.652	0.321	37.821	4.039	36.837	37.151	-0.992	0.044
Mother's blood pressure	72.115	9.857	70.780	71.200	-1.335	0.333	71.760	14.023	71.306	71.759	-0.453	0.732
PHQ total	14.539	3.885	14.437	2.783	-0.102	0.846	14.333	3.346	15.121	2.796	0.788	0.133
WHODAS total	15.538	9.023	16.487	5.379	0.905	0.443	16.450	8.845	16.750	5.528	0.300	0.786
PSS total	23.043	8.276	23.765	12.282	0.721	0.428	22.659	7.221	24.218	12.076	1.559	0.078
Joint/extended family	0.661	0.475	0.563	0.700	-0.098	0.046	0.628	0.485	0.637	0.704	0.009	0.883
Grandmother present	0.643	0.481	0.639	0.682	-0.005	0.948	0.705	0.458	0.677	0.752	-0.028	0.613
Total adults in the hh	5.635	3.044	5.454	5.722	-0.181	0.692	5.721	2.823	5.379	6.260	-0.342	0.391
People per room	2.365	1.218	2.565	2.211	0.199	0.342	2.409	1.359	2.934	2.241	0.525	0.045
Number of girls	0.904	1.116	0.874	0.697	-0.030	0.839	0.783	1.007	0.984	0.600	0.201	0.186
Number of boys	0.817	0.894	0.790	0.574	-0.027	0.822	0.791	0.982	0.855	0.600	0.064	0.621
First child	0.209	0.408	0.261	0.354	0.052	0.311	0.264	0.442	0.210	0.352	-0.054	0.252
SES asset index	-0.323	1.598	-0.136	0.216	0.187	0.359	-0.268	1.756	-0.802	0.611	-0.535	0.049
Mother's education	6.652	4.621	7.529	8.177	0.877	0.187	6.829	4.316	6.403	8.948	-0.426	0.499
Father's education	8.313	3.147	7.958	8.906	-0.355	0.395	8.550	3.264	7.734	9.328	-0.817	0.093
Life Events Checklist	4.061	2.137	4.588	2.989	0.527	0.067	4.163	2.361	4.976	2.712	0.813	0.001
Observations	115		119	277			129		124	250		
Joint test (p-value)						0.412						0.123

Note: Table tests for balance for the baseline characteristics by child gender. Columns 1,3 and 4 show the mean of the mothers of boys in the control, treatment and nondepressed group in the baseline sample, respectively.Columns 7,9 and 10 show the mean of the mothers of girls in the control, treatment and nondepressed group in the baseline sample, respectively. Columns 5 and 11 show the difference in means between nondepressed and depressed group, for mothers of boys and girls, respectively. p-values at the bottom of the table comes from the F-test of overall significance from a regression of the treatment dummy on all the baseline controls.

Table A7: Balance in the Non-depressed Sample

	Control ND		Treat ND	Diff.	SE	p-val
	Mean	SD	Mean	(TND-CND)		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother's Age	26.170	4.185	26.573	0.403	0.390	0.301
Mother's height (cm)	157.422	6.426	156.794	-0.628	0.516	0.224
Mother's weight (kg)	60.127	10.796	59.652	-0.475	1.103	0.667
Mother's waist circ. (in)	37.092	4.223	37.176	0.084	0.420	0.841
Mother's blood pressure	71.576	9.687	71.757	0.180	0.804	0.822
PHQ Total	2.792	2.438	2.800	0.008	0.293	0.979
WHODAS Total	5.381	6.235	5.841	0.460	0.596	0.440
PSS Total	12.467	6.619	11.963	-0.504	0.722	0.485
Joint/extended family	0.716	0.452	0.698	-0.018	0.044	0.686
Grandmother present	0.727	0.446	0.708	-0.018	0.035	0.600
Total adults in the hh	6.042	3.216	5.929	-0.113	0.256	0.659
People per room	2.260	1.825	2.171	-0.089	0.158	0.572
Number of girls	0.661	0.914	0.664	0.004	0.081	0.965
Number of boys	0.599	0.836	0.522	-0.077	0.069	0.270
First child	0.374	0.485	0.353	-0.021	0.037	0.566
SES asset index	0.365	1.429	0.477	0.112	0.156	0.474
Mother's education	8.176	4.310	8.949	0.773	0.476	0.104
Father's education	9.142	3.223	9.159	0.017	0.332	0.958
Life Events Checklist	2.799	2.197	2.990	0.191	0.267	0.476
Observations	289		295	584		
Joint test (p-value)						0.456

Note: Table tests for baseline balance in the sample of mothers who were not depressed at baseline. Columns 1 and 3 show the mean of the non-depressed mothers in the control and treatment clusters in the baseline sample, respectively. Column 4 shows the difference in means of the non-depressed mothers between treatment and control clusters. p-value at the bottom of the table comes from the F-test that jointly tests all coefficients with the null hypothesis of non-depressed women in the treatment and control clusters being balanced.

C Measurement System and Latent Factor Distributions

C.1 Exploratory Factor Analysis

This section provides the details of exploratory factor analysis (EFA) performed to specify the measurement system described in Tables A9 -A15. EFA consists of two parts: determination of the number of latent factors to be extracted from the set of measures in the data set and specifying the measurement system by allocating each measure to a factor and estimating factor loadings.

C.1.1 Determining the number of latent factors

To select the appropriate number of latent factors for child development, parental investment, and maternal mental health, the following methods are compared: Kaiser's eigenvalue rule, Cattel's scree plot, and Velicer's minimum average partial correlation rule. The resulting number of factors is reported in Table A8. The results support our assumptions of two-three dimensions for child development, two dimensions for maternal skills, and one dimension for parental investment.

Table A8: Results of different methods to determine the number of factors

	Number of Factors according to the following methods:		
	Kaiser's Eigenvalue Rule	Cattell's Scree Plot	Velicer's MAP Rule
Child's Skills at 6 Months	2	2	1
Child's Skills at 12 Months	3	2	1
Child's Skills at 24 Months	2	2	3
Child's Skills at 36 Months	3	2	4
Maternal Skills at 6 Months	3	2	1
Maternal Skills at 12 Months	2	2	1
Maternal Skills at 24 Months	4	2	5
Maternal Skills at 36 Months	3	2	1
Parental Investment at 6 Months	1	2	1
Parental Investment at 12 Months	1	2	1
Parental Investment at 24 Months	3	2	2
Parental Investment at 36 Months	1	2	1

C.1.2 Specifying the Measurement System

Once we have evidence about how many latent factors should be extracted, we need to allocate each measure to a factor in accordance with the dedicated measurement system. To do this, we implement the quartimin rotation method and identify the measures that primarily load on one factor. The reason why we choose this method among others is that since our factors are likely to be correlated, an oblique rotation is more suitable. At this stage, we also discard measures that load on more than one factor or are not strongly related to one factor as such measures would conflict with our assumption of a dedicated measurement system.

Table A9: Maternal Mental Health Measures I: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
6 months				
scid13: Current major depressive episode(-)	1.000	61.4%	90.5%	63.4%
scid1: Depressed Mode (-)	1.059	57.5%	56.2%	49.5%
scid2: Loss of interest (-)	1.035	57.3%	56.1%	59.3%
scid3: Weight/appetite loss or gain (-)	0.832	37.9%	34.3%	37.3%
scid4: Sleep disturbance (-)	0.858	38.6%	38.9%	37.9%
scid5: Psychomotor agitation or retardation(-)	1.055	61.2%	58.2%	55.2%
scid6: Fatigue or loss of energy (-)	1.025	50.0%	45.5%	33.4%
scid7: Feeling of worthlessness or inapropriate guilt (-)	0.696	30.0%	27.8%	36.3%
scid8: Diminished ability to concentrate or indecisiveness (-)	0.886	44.6%	43.5%	40.5%
scid9: Recurrent thoughts of death or suicidal ideation (-)	0.304	5.3%	7.4%	12.8%
scid10: Symptoms cause significant distress or impairment (-)	1.034	55.2%	55.9%	47.8%
pss3: How often have you felt nervous or stressed? (-)	1.047	53.2%	43.3%	36.3%
phq1: Feeling tired or having little energy. (-)	0.935	42.5%	39.5%	29.2%
phq2: Poor appetite or overeating. (-)	0.766	32.0%	31.2%	25.7%
phq3: Trouble falling or staying asleep (-)	0.705	26.3%	28.3%	26.7%
phq4: Moving/speaking so slowly (-)	0.871	44.0%	38.2%	43.3%
phq5: Trouble concentrating on things(-)	0.831	35.2%	36.8%	32.7%
phq6: Little interest or pleasure in doing things (-)	0.986	48.5%	50.3%	45.9%
phq7: Feeling down, depressed, hopeless (-)	1.077	59.1%	54.8%	47.6%
phq8: Feeling bad about yourself (-)	0.808	38.2%	40.9%	39.7%
12 months				
scid13: Current major depressive episode(-)	1.000	65.0%	57.5%	62.1%
scid1: Depressed Mode (-)	1.059	59.3%	53.7%	42.9%
scid2: Loss of interest (-)	1.035	60.2%	54.7%	47.6%
scid3: Weight/appetite loss or gain (-)	0.832	35.3%	28.3%	29.0%
scid4: Sleep disturbance (-)	0.858	38.9%	32.1%	32.0%
scid5: Psychomotor agitation or retardation(-)	1.055	56.5%	51.9%	46.3%
scid6: Fatigue or loss of energy (-)	1.025	50.5%	42.8%	31.4%
scid7: Feeling of worthlessness or inapropriate guilt (-)	0.696	32.0%	30.0%	34.4%
scid8: Diminished ability to concentrate or indecisiveness (-)	0.886	49.0%	41.4%	45.0%
scid10: Symptoms cause significant distress or impairment (-)	1.034	57.2%	49.6%	50.2%
pss1: In the last month, how often have you been upset? (-)	0.971	49.6%	47.3%	33.6%
pss2: How often have you felt you were unable to control things? (-)	0.968	53.8%	47.2%	34.8%
pss3: How often have you felt nervous or stressed? (-)	1.047	59.1%	56.5%	42.4%
pss4: How often have you felt confident?	0.890	39.4%	61.4%	21.6%
pss5: How often have you felt that things were going your way?	0.903	37.2%	39.9%	26.5%
pss8: How often have you felt that you were on top of things?	0.874	39.4%	35.1%	24.0%
pss10: How often have you felt difficulties piling up?(-)	0.926	44.7%	40.7%	31.2%

Note: This table reports the factor loadings of the measures allowed to load on the maternal mental health factor along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. All measures that were negatively worded in the follow-up surveys are reverse coded so that higher score means higher level of underlying skill.

Table A10: Maternal Mental Health Measures II: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
24 months				
scid13: Current major depressive episode(-)	1.000	25.2%	25.2%	15.9%
scid1: Depressed Mode (-)	1.059	46.5%	44.9%	32.0%
scid2: Loss of interest (-)	1.035	21.9%	34.0%	18.5%
scid3: Weight/appetite loss or gain (-)	0.832	51.7%	63.8%	37.9%
scid4: Sleep disturbance (-)	0.858	80.5%	65.6%	34.3%
scid5: Psychomotor agitation or retardation(-)	1.055	41.3%	58.2%	26.2%
scid6: Fatigue or loss of energy (-)	1.025	62.5%	65.0%	61.1%
scid7: Feeling of worthlessness or inapropriate guilt (-)	0.696	66.6%	54.2%	29.3%
scid8: Diminished ability to concentrate or indecisiveness (-)	0.886	49.3%	46.4%	33.3%
scid10: Symptoms cause significant distress or impairment (-)	1.034	32.5%	25.5%	27.9%
phq2: Poor appetite or overeating. (-)	0.766	58.4%	82.8%	43.3%
phq3: Trouble falling or staying asleep (-)	0.705	77.3%	78.8%	44.4%
phq4: Moving/speaking so slowly (-)	0.871	59.7%	58.1%	32.4%
phq6: Little interest or pleasure in doing things (-)	0.986	60.6%	26.2%	45.9%
phq7: Feeling down, depressed, hopeless (-)	1.077	55.8%	46.1%	39.7%
phq8: Feeling bad about yourself (-)	0.808	60.8%	40.9%	26.2%
36 months				
scid13: Current major depressive episode (-)	1.000	66.6%	56.0%	58.8%
scid1: Depressed Mode (-)	1.059	62.8%	54.0%	56.9%
scid5: Psychomotor agitation or retardation(-)	1.055	69.4%	57.3%	64.5%
scid6: Fatigue or loss of energy (-)	1.025	59.1%	50.9%	49.9%
scid10: Symptoms cause significant distress or impairment (-)	1.034	68.8%	54.4%	59.0%
pss1: In the last month, how often have you been upset? (-)	0.971	62.9%	52.3%	53.5%
pss2: How often have you felt you were unable to control things? (-)	0.968	62.8%	54.5%	52.4%
pss3: How often have you felt nervous or stressed? (-)	1.047	71.7%	59.8%	56.8%
pss4: How often have you felt confident?	0.890	51.9%	45.6%	39.6%
pss5: How often have you felt that things were going your way?	0.903	52.2%	46.9%	35.6%
pss6: How often have you felt that you cannot cope with things?(-)	0.939	51.3%	41.8%	35.9%
pss8: How often have you felt that you were on top of things?	0.874	39.4%	48.3%	38.9%
pss10: How often have you felt difficulties piling up? (-)	0.926	53.0%	50.4%	38.8%
phq1: Feeling tired or having little energy. (-)	0.935	47.5%	39.1%	38.7%
phq3: Trouble falling or staying asleep (-)	0.705	33.1%	25.2%	30.1%
phq4: Moving/speaking so slowly (-)	0.871	51.2%	38.2%	50.1%
phq5: Trouble concentrating on things (-)	0.831	42.1%	32.1%	32.9%
phq6: Little interest or pleasure in doing things (-)	0.986	61.7%	51.3%	59.7%
phq7: Feeling down, depressed, hopeless (-)	1.077	77.2%	60.8%	58.5%
phq8: Feeling bad about yourself (-)	0.808	47.6%	40.9%	46.5%
gad1: Feeling nervous, anxious or on edge. (-)	0.988	65.2%	54.6%	56.0%
gad2: Not being able to stop or control worrying. (-)	0.965	68.7%	54.5%	57.9%
gad3: Worrying too much about different things. (-)	0.906	59.8%	59.9%	51.5%
gad4: Trouble relaxing (-)	0.919	38.2%	60.9%	57.9%
gad5: Being so restless it's hard to sit still. (-)	0.916	59.8%	58.7%	57.9%
gad6: Becoming easily annoyed or irritable. (-)	0.967	56.7%	54.4%	51.4%
gad7: Feeling afraid as if something awful might happen. (-)	0.972	60.8%	45.2%	55.1%

Note: This table reports the factor loadings of the measures allowed to load on the maternal mental health factor along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. All measures that were negatively worded in the follow-up surveys are reverse coded so that higher score means higher level of underlying skill.

Table A11: Maternal Functioning Measures: Loadings and Signal-to-noise Ratio

Measurement	Loading	% Signal		
		Control	Treated	Nondep.
6 months				
whodas12: Difficulty affecting day-to-day work.(-)	1.000	69.5%	61.1%	62.4%
whodas2: Difficulty standing for long periods (-)	0.949	55.1%	55.7%	36.8%
whodas3: Difficulty taking care of household responsibilities (-)	1.032	68.7%	64.2%	50.9%
whodas4: Difficulty learning a new task (-)	0.820	55.1%	46.5%	35.5%
whodas5: Difficulty joining in community activities (-)	0.894	54.5%	45.4%	46.7%
whodas6: Difficulty concentrating (-)	0.881	58.2%	53.4%	41.5%
whodas7: Difficulty walking a long distance (-)	0.917	52.5%	49.9%	27.0%
whodas8: Difficulty washing your whole body (-)	0.612	31.0%	26.4%	31.2%
whodas9: Difficulty getting dressed (-)	0.588	27.9%	20.5%	39.1%
whodas10: Difficulty dealing with people you do not know (-)	0.797	39.1%	44.9%	31.7%
whodas11: Dealing with maintaining a friendship (-)	0.741	37.7%	37.7%	32.1%
whodas13: How much have you been affected by your health problems? (-)	0.986	63.7%	58.3%	45.6%
12 months				
whodas12: Difficulty affecting day-to-day work.(-)	1.000	67.4%	63.3%	66.6%
whodas2: Difficulty standing for long periods (-)	0.949	56.6%	49.9%	43.8%
whodas3: Difficulty taking care of household responsibilities (-)	1.032	70.1%	64.5%	61.6%
whodas4: Difficulty learning a new task (-)	0.820	50.3%	43.5%	42.0%
whodas5: Difficulty joining in community activities (-)	0.894	52.7%	48.4%	46.2%
whodas6: Difficulty concentrating (-)	0.881	55.3%	52.7%	55.1%
whodas7: Difficulty walking a long distance (-)	0.917	55.8%	43.5%	41.8%
whodas8: Difficulty washing your whole body (-)	0.612	29.5%	33.6%	41.6%
whodas9: Difficulty getting dressed (-)	0.588	27.5%	30.9%	32.4%
whodas10: Difficulty dealing with people you do not know (-)	0.797	41.8%	36.9%	34.9%
whodas13: How much have you been affected by your health problems? (-)	0.986	62.6%	52.9%	55.5%
24 months				
whodas12: Difficulty affecting day-to-day work.(-)	1.000	67.4%	68.4%	71.6%
whodas2: Difficulty standing for long periods (-)	0.949	59.5%	57.0%	57.2%
whodas3: Difficulty taking care of household responsibilities (-)	1.032	69.8%	70.2%	74.2%
whodas4: Difficulty learning a new task (-)	0.820	47.7%	34.3%	62.6%
whodas5: Difficulty joining in community activities (-)	0.894	55.8%	54.9%	57.4%
whodas6: Difficulty concentrating (-)	0.881	53.0%	44.2%	61.8%
whodas7: Difficulty walking a long distance (-)	0.917	55.5%	51.4%	48.6%
whodas8: Difficulty washing your whole body (-)	0.612	27.2%	21.9%	32.2%
whodas9: Difficulty getting dressed (-)	0.588	25.1%	14.4%	13.6%
whodas10: Difficulty dealing with people you do not know (-)	0.797	48.9%	43.0%	47.5%
whodas11: Dealing with maintaining a friendship (-)	0.741	36.1%	32.8%	37.3%
whodas13: How much have you been affected by your health problems? (-)	0.986	66.8%	59.5%	62.1%
36 months				
whodas12: Difficulty affecting day-to-day work.(-)	1.000	82.2%	75.7%	77.7%
whodas2: Difficulty standing for long periods (-)	0.949	66.0%	54.1%	50.7%
whodas3: Difficulty taking care of household responsibilities (-)	1.032	78.7%	70.5%	69.9%
whodas4: Difficulty learning a new task (-)	0.820	58.2%	51.9%	54.0%
whodas5: Difficulty joining in community activities (-)	0.894	66.4%	61.2%	65.6%
whodas6: Difficulty concentrating (-)	0.881	71.8%	65.5%	64.6%
whodas7: Difficulty walking a long distance (-)	0.917	64.1%	56.7%	52.1%
whodas8: Difficulty washing your whole body (-)	0.612	32.1%	31.1%	33.5%
whodas9: Difficulty getting dressed (-)	0.588	30.3%	29.9%	43.6%
whodas10: Difficulty dealing with people you do not know (-)	0.797	53.2%	44.5%	48.2%
whodas11: Dealing with maintaining a friendship (-)	0.741	46.2%	44.5%	38.1%
whodas13: How much have you been affected by your health problems? (-)	0.986	76.5%	69.8%	70.5%

Note: This table reports the factor loadings of the measures allowed to load on the maternal functioning factor along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. All measures that were negatively worded in the follow-up surveys are reverse coded so that higher score means higher level of underlying skill.

Table A12: Socioemotional Measures of Child: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
6 months				
asq1:Baby calms down within a half hour.	1.000	31.2%	22.0%	16.5%
asq6:Baby lets you know when she is hungry/sick.	0.391	4.8%	2.0%	2.0%
asq8:Baby is able to calm herself down.(-)	0.949	27.5%	17.2%	13.8%
asq9:Baby cries for a long period of time. (-)	1.130	34.8%	31.4%	26.7%
asq10:Baby's body is relaxed.	0.878	21.8%	5.2%	17.5%
asq11:Baby has trouble sucking.(-)	0.508	7.5%	2.5%	3.4%
asq14:Baby has an eating problem. (-)	0.575	11.6%	7.6%	5.1%
asq16:Baby has trouble falling asleep. (-)	0.700	17.1%	5.5%	8.80%
asq17:Baby sleeps at least 10 hours a day.	0.720	18.7%	6.5%	11.9%
asq18:Baby gets constipated or have diarrhea. (-)	0.654	14.2%	4.8%	5.5%
asq19:Someone expressed concerns about baby's behaviour. (-)	0.601	12.7%	3.6%	4.0%
12 months				
asq1:Baby calms down within a half hour.	1.000	37.2%	34.5%	22.3%
asq3:Baby likes to be picked up.	0.396	5.7%	9.0%	1.1%
asq4:Baby stiffens when picked up. (-)	0.482	8.3%	5.8%	4.3%
asq8:Baby is able to calm herself down.	0.949	32.6%	23.9%	15.4%
asq9:Baby cries for a long time.(-)	1.130	46.0%	51.1%	38.1%
asq10:Baby's body is relaxed.	0.878	24.7%	30.6%	22.9%
asq14:Baby has an eating problem. (-)	0.575	10.8%	8.6%	8.3%
asq16:Baby has a problem falling asleep. (-)	0.700	16.3%	30.1%	13.1%
asq17:Baby sleeps at least 10 hours a day.	0.720	16.5%	14.5%	12.5%
asq18:Baby gets constipated or have diarrhea.(-)	0.654	13.2%	10.5%	7.9%
asq19:Someone expressed concerns about baby's behaviour. (-)	0.601	12.4%	11.4%	4.6%
asq20:Concerns about baby's eating/sleeping behaviour. (-)	0.495	8.5%	6.6%	4.1%
24 months				
asq8:Child calms down within 15 minutes.	1.000	44.0%	46.4%	78.5%
asq3:Child laughs or smile when you play with her.	1.539	98.6%	76.2%	95.2%
asq4:Child's body is relaxed.	0.878	65.8%	66.1%	79.6%
asq6:Child greets familiar adults.	1.581	70.2%	87.0%	92.7%
asq10:Child is interested in surroundings.	1.131	56.9%	87.4%	89.4%
asq12:You and your child enjoy mealtimes together.	1.359	69.3%	96.2%	78.4%
asq19:Child lets you know how she feels.	0.964	35.5%	35.6%	52.1%
asq20:Child checks to make sure you are near.	1.024	32.7%	40.0%	50.0%
asq22:Child likes to hear stories/songs.	0.891	32.7%	46.0%	49.4%
36 months				
asq5:Child calms down within 15 minutes.	1.000	28.1%	37.2%	12.1%
asq3:Child plays/talks with adults she knows well.	0.810	20.1%	25.4%	17.2%
asq7:Child can settle herself down.	1.565	65.2%	63.0%	35.0%
asq8:Child easily moves from one activity to next.	1.036	28.7%	36.3%	9.3%
asq9:Child seems happy.	1.710	72.0%	58.0%	49.2%
asq10:Child is interested in surroundings.	1.131	33.3%	29.6%	13.5%
asq11:Child does what you ask her to do.	1.351	39.1%	35.4%	22.0%
asq13:Child can stay with an activity for 5 min.	0.993	25.3%	36.6%	21.4%
asq14:You and your child enjoy mealtimes together.	1.359	43.9%	35.2%	24.7%
sdq14:Generally liked by other children	0.561	7.5%	7.5%	4.8%
sdq25:Good attention span.	0.666	10.4%	9.1%	4.0%

Note: This table reports the factor loadings of the measures allowed to load on the socioemotional factor of the child along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. All measures that were negatively worded in the follow-up surveys are reverse coded so that higher score means higher level of underlying skill.

Table A13: Physical Health Measures of Child: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
6 months				
Weight for age z-score	1.000	75.0%	62.8%	60.9%
Height for age z-score	0.819	43.9%	43.4%	42.8%
Head circumference for age z-score	0.709	34.6%	31.9%	32.4%
12 months				
Weight for age z-score	1.000	68.9%	58.9%	60.8%
Height for age z-score	0.819	53.6%	46.8%	25.7%
Head circumference for age z-score	0.709	27.0%	24.1%	29.8%
24 months				
Weight for age z-score	1.000	66.5%	75.1%	67.7%
Height for age z-score	0.818	44.1%	47.5%	45.3%
Head circumference for age z-score	0.709	31.0%	26.4%	28.3%
36 months				
Weight for age z-score	1.000	78.0%	87.9%	82.8%
Height for age z-score	0.819	53.6%	45.9%	45.8%

Note: This table reports the factor loadings of the measures allowed to load on the physical health factor of the child along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. Z-scores are calculated based on the WHO Child Growth Standards.

Table A14: Cognitive Measures of Child: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
12 months				
Bayley: Fine motor scaled score	1.000	57.5%	67.3%	55.4%
Bayley: Receptive scaled score	0.679	28.2%	35.0%	22.0%
Bayley: Cognitive scaled score	0.949	48.2%	69.7%	60.1%
Bayley: Expressive scaled score	0.648	23.7%	38.0%	27.8%
Bayley: Gross motor scaled score	0.639	23.6%	31.0%	20.0%
36 months				
Bayley: Fine motor scaled score	1.000	44.3%	49.4%	49.8%
Bayley: Receptive scaled score	0.679	20.2%	19.0%	18.5%

Note: This table reports the factor loadings of the measures allowed to load on the cognition factor of the child along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control,treatment and nondepressed group separately. Bayley scaled scores are calculated from the raw scores such that they have mean=10 and SD=3.

Table A15: Parental Investment Measures: Loadings and Signal-to-noise Ratio

Measurement	**Loading**	% **Signal**		
		Control	Treated	Nondep.
6 months				
Maternal Postnatal Attachment Score	1.000	41.4%	37.5%	45.9%
Maternal Self-Efficacy Score	0.869	35.5%	29.2%	38.2%
12 months				
HOME: Learning Material	1.000	63.0%	59.1%	55.4%
HOME: Responsivity	0.284	5.1%	6.4%	5.1%
HOME: Organization	0.602	23.6%	25.8%	20.4%
HOME: Involvement	0.872	46.7%	49.2%	44.5%
HOME: Variety	0.535	17.4%	11.9%	14.4%
24 months				
Omci2: Mom shows negative affect for child (-)	1.000	85.3%	69.2%	61.9%
Omci1: Mom shows positive affect for child.	0.291	9.7%	3.5%	7.9%
Omci3: Mom loses attention towards the child. (-)	0.436	13.5%	9.1%	10.1%
Omci5: Mom shows negative touch. (-)	0.836	47.1%	25.4%	34.6%
Omci7: Mom expresses negative verbal statement.(-)	0.708	32.4%	26.1%	38.7%
Omci8: Mom shows intrusiveness. (-)	0.534	13.5%	28.8%	13.4%
36 months				
HOME: Learning Material	1.000	57.7%	55.5%	58.6%
HOME: Acceptance	0.158	1.5%	1.9%	1.5%
HOME: Organization	0.602	21.3%	20.8%	20.9%
HOME: Involvement	0.872	48.3%	49.3%	41.2%
HOME: Variety	0.535	17.1%	18.9%	14.4%

Note: This table reports the factor loadings of the measures allowed to load on the parental investment factor along with the fraction of variance in each measure that is explained by the variance of the underlying latent factor for the control, treatment and nondepressed group separately. Maternal postnatal attachment score is a sum score from a 19 item questionnaire assessing mother-infant attachment. Maternal self-efficacy score is a sum score from a 10 item questionnaire measuring mother's ability to care for her child. Items reported under 12 and 36 months are used to estimate the longitudinal investment factor model. Items at 6 and 24 months are used to estimate investment factors at these follow-up points for descriptive purposes.

C.2 Estimated Latent Factor Correlations

The following figures provide the correlations between the estimated latent factors at 6, 12 and 36 months in control and the treatment groups separately.

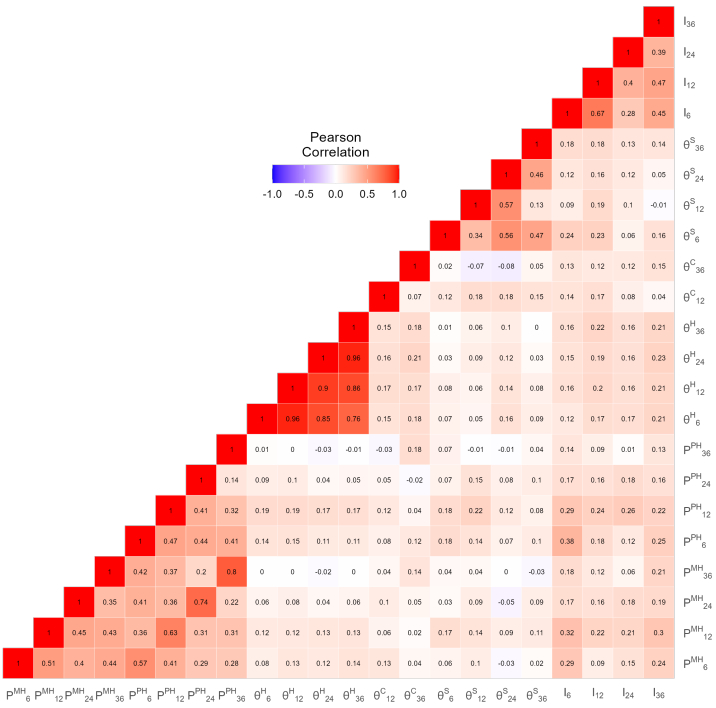


Figure A1: Estimated Latent Factor Correlations: Control Group

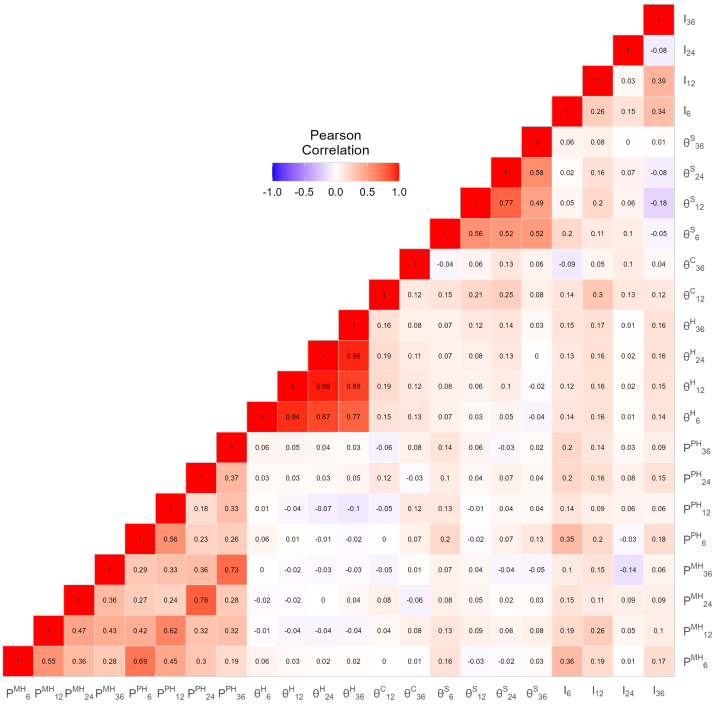


Figure A2: Estimated Latent Factor Correlations: Treatment Group

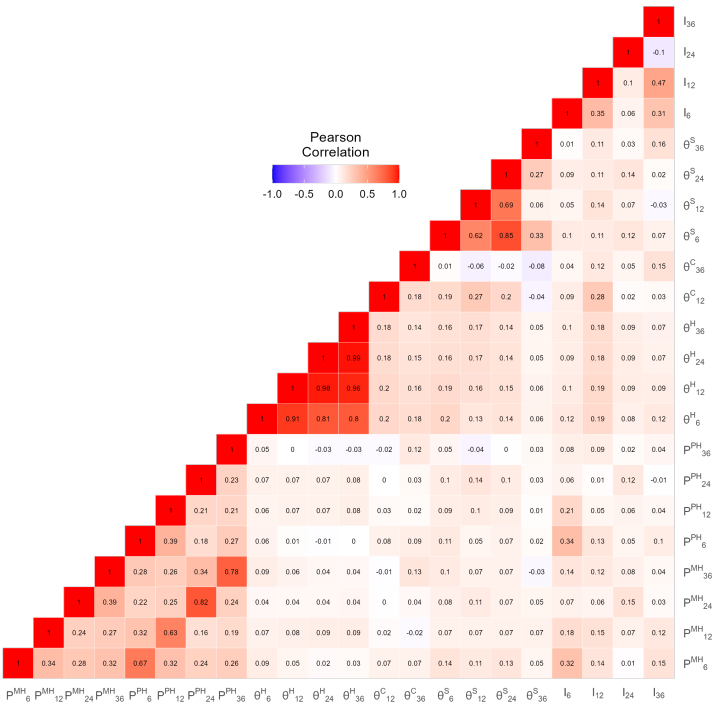


Figure A3: Estimated Latent Factor Correlations: Nondepressed Group

D Treatment Effects on the Fixed Subset

The following tables present the estimated treatment effects for the fixed subset of mothers who were present at 6, 12, 24 and 36 months follow-up waves. (N=771).

Table A16: Trajectory of Maternal Measures for the Fixed Subset (N=771)

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val
	Mean	SD	Mean	Mean	(T-C)	Beta		
6 Months								
PHQ Total	6.590	6.141	5.995	3.261	-0.596	-0.897	0.404	0.026
PHQ Categorized								
Minimal (0-4)	0.463	0.500	0.516	0.722	0.054	0.072	0.031	0.020
Mild (5-9)	0.234	0.425	0.255	0.188	0.021	0.017	0.034	0.610
Moderate (10-14)	0.144	0.352	0.109	0.045	-0.035	-0.039	0.029	0.177
Moderately Severe (15-19)	0.133	0.340	0.082	0.038	-0.051	-0.048	0.022	0.030
Severe (20+)	0.027	0.161	0.038	0.008	0.011	-0.003	0.012	0.825
PSS Total	16.761	9.334	15.701	11.318	-1.060	-1.647	0.537	0.002
Current Major Dep. Episode	0.209	0.407	0.168	0.065	-0.040	-0.071	0.025	0.005
Remission	0.463	0.500	0.516		0.054	0.072	0.031	0.020
Recovery	0.457	0.500	0.592		0.135	0.147	0.032	0.000
Mental Health Index	**0**	**1**	**0.098**	**0.420**	**0.098**	**0.156**	**0.078**	**0.045**
Mental Health Factor	**0**	**1**	**0.144**	**0.581**	**0.144**	**0.199**	**0.059**	**0.001**
Whodas Total	7.574	9.551	6.337	2.940	-1.238	-1.820	0.711	0.010
Functioning Index	**0**	**1**	**0.182**	**0.433**	**0.182**	**0.225**	**0.080**	**0.005**
Functioning Factor	**0**	**1**	**0.130**	**0.513**	**0.130**	**0.193**	**0.073**	**0.008**
Mother Index	**0**	**1**	**0.159**	**0.449**	**0.159**	**0.210**	**0.079**	**0.008**
12 Months								
PSS Total	16.851	9.384	16.897	11.935	0.046	-0.282	0.647	0.663
Current Major Dep. Episode	0.266	0.443	0.266	0.093	0.000	-0.008	0.026	0.746
Mental Health Index	**0**	**1**	**0.053**	**0.392**	**0.053**	**0.045**	**0.058**	**0.444**
Mental Health Factor	**0**	**1**	**0.033**	**0.570**	**0.033**	**0.027**	**0.053**	**0.617**
Whodas Total	6.590	8.605	5.630	3.135	-0.960	-1.713	0.562	0.002
Functioning Index	**0**	**1**	**0.194**	**0.379**	**0.194**	**0.280**	**0.064**	**0.000**
Functioning Factor	**0**	**1**	**0.118**	**0.431**	**0.118**	**0.189**	**0.057**	**0.001**
Mother Index	**0**	**1**	**0.174**	**0.397**	**0.174**	**0.208**	**0.064**	**0.001**
24 Months								
PHQ Total	6.697	5.823	6.848	3.810	0.151	-0.117	0.418	0.779
PHQ Categorized								
Minimal (0-4)	0.431	0.497	0.435	0.682	0.004	0.028	0.033	0.396
Mild (5-9)	0.303	0.461	0.315	0.203	0.012	-0.020	0.034	0.548
Moderate (10-14)	0.154	0.362	0.136	0.078	-0.018	-0.007	0.028	0.813
Moderately Severe (15-19)	0.064	0.245	0.054	0.025	-0.009	-0.005	0.022	0.836
Severe (20+)	0.048	0.214	0.060	0.013	-0.012	0.004	0.011	0.735
PSS Total	13.489	7.946	15.870	10.426	2.380	1.712	0.658	0.009
Current Major Dep. Episode	0.246	0.432	0.246	0.101	0.000	0.004	0.033	0.396
Mental Health Index	**0**	**1**	**-0.178**	**0.334**	**-0.178**	**-0.081**	**0.062**	**0.195**
Mental Health Factor	**0**	**1**	**0.005**	**0.515**	**0.005**	**-0.009**	**0.062**	**0.889**
Whodas Total	7.339	8.350	7.913	3.892	0.514	0.561	0.581	0.335
Functioning Index	**0**	**1**	**-0.039**	**0.390**	**-0.039**	**-0.059**	**0.073**	**0.422**
Functioning Factor	**0**	**1**	**-0.050**	**0.449**	**-0.050**	**-0.057**	**0.067**	**0.395**
Mother Index	**0**	**1**	**-0.169**	**0.360**	**-0.169**	**-0.096**	**0.067**	**0.152**
36 Months								
PHQ Total	5.995	5.889	5.918	3.461	-0.076	-0.970	0.411	0.018
PHQ Categorized								
Minimal (0-4)	0.537	0.500	0.527	0.734	-0.010	0.036	0.034	0.290
Mild (5-9)	0.239	0.428	0.217	0.128	-0.022	-0.014	0.031	0.643
Moderate (10-14)	0.090	0.288	0.152	0.095	0.062	0.051	0.018	0.005
Moderately Severe (15-19)	0.101	0.302	0.071	0.035	-0.030	-0.062	0.016	0.000
Severe (20+)	0.032	0.176	0.033	0.008	0.001	-0.011	0.014	0.459
PSS Total	14.399	9.681	13.832	9.817	-0.567	-1.967	0.770	0.011
GAD Total	5.188	6.162	4.607	3.068	-0.581	-1.917	0.503	0.000
GAD Total >10	0.176	0.381	0.130	0.085	-0.045	-0.072	0.033	0.027
Current Major Dep. Episode	0.191	0.395	0.158	0.093	-0.034	-0.096	0.029	0.001
Mental Health Index	**0**	**1**	**0.163**	**0.401**	**0.163**	**0.306**	**0.096**	**0.001**
Mental Health Factor	**0**	**1**	**0.051**	**0.452**	**0.051**	**0.190**	**0.071**	**0.008**
Whodas Total	5.915	8.576	5.815	3.391	-0.100	-1.551	0.626	0.013
Functioning Index	**0**	**1**	**0.009**	**0.281**	**0.009**	**0.161**	**0.076**	**0.033**
Functioning Factor	**0**	**1**	**0.017**	**0.310**	**0.017**	**0.184**	**0.073**	**0.011**
Mother Index	**0**	**1**	**0.159**	**0.384**	**0.159**	**0.325**	**0.096**	**0.001**

Note: Table shows treatment effects on the reported items and Anderson indices for the subset of mothers who were present at all four waves (N=771). Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Functioning Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available. Remission: Proportion of depressed at baseline having PHQ Total<5 at 3 or 6 months. Recovery: Proportion of depressed at baseline having PHQ Total<5 at 3 and 6 months.

Table A17: Trajectory of Child Measures for the Fixed Subset I (N=771)

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val
	Mean	SD	Mean	Mean	(T-C)	Beta		
6 Months								
Weight for age z-score	-0.806	1.099	-0.885	-0.882	-0.080	-0.132	0.086	0.125
Height for age z-score	0.098	1.625	0.323	0.080	0.224	0.020	0.124	0.873
Head Circ. for age z-score	-0.801	1.035	-0.840	-0.826	-0.039	-0.139	0.087	0.110
Child Health Index	**0**	**1**	**0.027**	**-0.040**	**0.027**	**-0.090**	**0.075**	**0.229**
Child Health Factor	**0**	**1**	**-0.023**	**-0.052**	**-0.023**	**-0.100**	**0.070**	**0.148**
ASQ Total	9.940	13.777	9.600	9.288	-0.340	0.533	1.270	0.674
ASQ Self-regulation	4.077	7.085	3.857	4.000	-0.220	-0.092	0.647	0.888
ASQ Communication	0.268	1.369	0.457	0.548	0.189	0.366	0.155	0.018
ASQ Adaptive Func.	4.137	6.589	3.857	3.658	-0.280	0.265	0.525	0.614
ASQ Affect	0.387	1.730	0.714	0.411	0.327	0.542	0.164	0.001
ASQ Interaction	0.893	2.698	0.543	0.397	-0.350	-0.538	0.251	0.032
Child SE Index	**0**	**1**	**0.073**	**0.160**	**0.073**	**0.021**	**0.068**	**0.759**
Child SE Factor	**0**	**1**	**0.089**	**0.053**	**0.089**	**0.120**	**0.068**	**0.080**
Child Index	**0**	**1**	**0.080**	**0.152**	**0.080**	**-0.001**	**0.066**	**0.987**
12 Months								
Weight for age z-score	-0.797	1.154	-0.736	-0.778	0.061	0.079	0.096	0.409
Height for age z-score	-0.817	1.308	-0.726	-0.765	0.092	0.051	0.084	0.544
Head Circ. for age z-score	-0.819	1.000	-0.951	-0.936	-0.132	-0.224	0.085	0.009
Child Health Index	**0**	**1**	**-0.015**	**-0.035**	**-0.015**	**-0.058**	**0.082**	**0.478**
Child Health Factor	**0**	**1**	**0.026**	**0.018**	**0.026**	**-0.003**	**0.070**	**0.962**
ASQ Total	11.489	14.373	9.538	9.737	-1.951	-1.949	0.949	0.040
ASQ Self-regulation	5.226	8.967	3.451	4.060	-1.815	-2.126	0.579	0.000
ASQ Communication	0.452	2.051	0.734	0.489	0.282	0.185	0.116	0.111
ASQ Adaptive Func.	4.920	6.364	4.538	4.286	-0.382	0.107	0.432	0.804
ASQ Affect	0.293	1.385	0.190	0.326	-0.102	-0.160	0.119	0.177
ASQ Interaction	0.372	1.674	0.408	0.276	0.035	0.079	0.121	0.515
Child SE Index	**0**	**1**	**0.115**	**0.099**	**0.115**	**0.137**	**0.059**	**0.020**
Child SE Factor	**0**	**1**	**0.188**	**0.163**	**0.188**	**0.220**	**0.077**	**0.004**
Bayley Cognitive (scaled)	9.414	2.150	9.339	9.466	-0.075	-0.058	0.215	0.786
Bayley Receptive (scaled)	8.032	1.347	7.983	7.959	-0.049	-0.109	0.095	0.252
Bayley Expressive (scaled)	9.215	1.513	9.006	9.244	-0.209	-0.242	0.131	0.065
Bayley Fine motor (scaled)	9.199	1.597	8.878	9.079	-0.321	-0.390	0.140	0.005
Bayley Gross motor (scaled)	8.333	2.107	8.206	8.206	-0.128	-0.159	0.203	0.433
Child Cog Index	**0**	**1**	**-0.121**	**-0.038**	**-0.121**	**-0.165**	**0.095**	**0.082**
Child Cog Factor	**0**	**1**	**-0.168**	**-0.217**	**-0.168**	**-0.213**	**0.104**	**0.040**
Child Index	**0**	**1**	**0.082**	**0.079**	**0.082**	**0.074**	**0.057**	**0.196**

Note: SE=socioemotional skills. Table shows treatment effects on the reported items and Anderson indices for the subset of mothers who were present at all four waves (N=771). Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Physical Health Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available.

Table A18: Trajectory of Child Measures for the Fixed Subset II (N=771)

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val
	Mean	SD	Mean	Mean	(T-C)	Beta		
24 Months								
Weight for age z-score	-0.861	1.010	-1.007	-0.844	-0.146	-0.146	0.073	0.045
Height for age z-score	-1.097	1.223	-1.146	-0.994	-0.050	-0.066	0.095	0.485
Head Circ. for age z-score	-0.782	0.874	-0.938	-0.956	-0.156	-0.230	0.085	0.007
Child Health Index	**0**	**1**	**-0.149**	**-0.039**	**-0.149**	**-0.183**	**0.080**	**0.023**
Child Health Factor	**0**	**1**	**-0.179**	**-0.017**	**-0.179**	**-0.198**	**0.085**	**0.020**
ASQ Total	10.856	20.434	12.596	12.103	1.740	1.807	1.184	0.127
ASQ Self-regulation	2.473	5.509	2.554	2.318	0.081	0.220	0.367	0.549
ASQ Compliance	0.106	1.029	0.217	0.301	0.111	0.176	0.069	0.011
ASQ Communication	0.665	3.539	0.571	0.777	-0.094	0.047	0.187	0.801
ASQ Adaptive Func.	1.170	2.918	1.277	1.103	0.107	-0.045	0.250	0.856
ASQ Autonomy	0.213	1.447	0.326	0.426	0.113	0.147	0.077	0.058
ASQ Affect	0.771	3.114	0.761	0.802	-0.010	0.008	0.248	0.973
ASQ Interaction	5.321	8.561	6.694	6.247	1.373	1.347	0.526	0.011
Child SE Index	**0**	**1**	**0.125**	**0.117**	**0.125**	**0.157**	**0.069**	**0.023**
Child SE Factor	**0**	**1**	**-0.047**	**-0.111**	**-0.047**	**-0.122**	**0.057**	**0.032**
Child Index	**0**	**1**	**0.085**	**0.111**	**0.085**	**0.109**	**0.072**	**0.133**
36 Months								
Weight for age z-score	-0.916	1.016	-1.058	-0.967	-0.141	-0.167	0.100	0.095
Height for age z-score	-0.859	1.020	-0.919	-0.788	-0.061	-0.091	0.103	0.375
Child Health Index	**0**	**1**	**-0.121**	**-0.006**	**-0.121**	**-0.157**	**0.099**	**0.113**
Child Health Factor	**0**	**1**	**-0.167**	**-0.028**	**-0.167**	**-0.204**	**0.092**	**0.027**
ASQ Total	40.718	17.570	40.625	38.784	-0.093	-0.490	1.438	0.733
ASQ Self-regulation	19.255	9.728	18.397	18.083	-0.859	-0.988	0.616	0.108
ASQ Compliance	0.612	2.074	0.788	0.639	0.176	0.272	0.177	0.123
ASQ Communication	0.691	2.206	0.761	0.614	0.069	-0.009	0.265	0.974
ASQ Adaptive Func.	2.952	4.646	3.451	2.982	0.499	0.204	0.506	0.688
ASQ Autonomy	10.160	2.780	9.511	9.850	-0.649	-0.616	0.157	0.000
ASQ Affect	0.612	2.375	0.842	0.414	0.231	0.415	0.249	0.095
ASQ Interaction	6.436	5.429	6.875	6.203	0.439	0.232	0.383	0.545
SDQ Total	14.649	6.279	14.467	13.424	-0.182	0.054	0.307	0.859
Boi Total	24.883	3.754	24.875	25.000	-0.008	-0.065	0.341	0.848
Child SE Index	**0**	**1**	**0.102**	**0.254**	**0.102**	**0.087**	**0.089**	**0.324**
Child SE Factor	**0**	**1**	**-0.005**	**0.096**	**-0.005**	**-0.073**	**0.086**	**0.395**
Bayley Receptive (scaled)	10.016	2.593	10.412	10.303	0.396	0.332	0.229	0.148
Bayley Fine motor (scaled)	11.610	4.109	11.500	11.246	-0.110	-0.021	0.290	0.943
Child Cog Index	**0**	**1**	**0.055**	**-0.005**	**0.055**	**0.055**	**0.080**	**0.496**
Child Cog Factor	**0**	**1**	**0.000**	**-0.097**	**0.000**	**0.019**	**0.080**	**0.815**
Child Index	**0**	**1**	**0.079**	**0.240**	**0.079**	**0.061**	**0.088**	**0.493**

Note: SE=socioemotional skills. Table shows treatment effects on the reported items and Anderson indices for the subset of mothers who were present at all four waves (N=771). Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Mental Health Index : all PHQ items + all PSS items + all SCID items + all GAD items whenever available. Physical Health Index : all Whodas items. Mother Index : all PHQ items + all PSS items + all SCID items + all GAD items + all Whodas items whenever available.

Table A19: Trajectory of Parental Investment for the Fixed Subset (N=771)

Measurement	Control		Treatment	Nondep.	Diff.	Adjusted	SE	p-val
	Mean	SD	Mean	Mean	(T-C)	Beta		
6 Months								
MPAS Total	86.296	6.345	86.221	87.543	-0.075	0.007	0.362	0.984
MSES Total	36.963	3.650	37.201	37.840	0.238	0.083	0.228	0.718
Investment Index	**0**	**1**	**0.135**	**0.226**	**0.135**	**0.111**	**0.056**	**0.047**
Investment Factor	**0**	**1**	**0.039**	**0.417**	**0.039**	**0.034**	**0.049**	**0.485**
12 Months								
HOME Total	30.803	5.761	31.212	32.534	0.409	0.748	0.451	0.098
HOME Responsivity	9.644	1.504	9.853	9.810	0.210	0.244	0.128	0.056
HOME Acceptance	6.112	1.427	6.277	6.216	0.165	0.270	0.105	0.010
HOME Organization	3.505	1.358	3.489	3.772	-0.016	0.000	0.105	0.998
HOME Learning Mat.	4.793	2.555	4.913	5.589	0.120	0.269	0.192	0.161
HOME Involvement	3.894	1.477	3.929	4.238	0.036	0.056	0.114	0.625
HOME Variety	2.856	0.523	2.750	2.910	-0.106	-0.091	0.068	0.179
Investment Index	**0**	**1**	**0.153**	**0.281**	**0.153**	**0.158**	**0.099**	**0.112**
Investment Factor	**0**	**1**	**0.044**	**0.421**	**0.044**	**0.103**	**0.081**	**0.200**
24 Months								
OMCI Total	37.396	4.699	36.921	38.213	-0.475	-0.360	0.428	0.401
Investment Index	**0**	**1**	**-0.095**	**0.189**	**-0.095**	**-0.078**	**0.086**	**0.360**
Investment Factor	**0**	**1**	**0.006**	**0.100**	**0.006**	**-0.028**	**0.082**	**0.736**
36 Months								
HOME Total	37.601	4.261	37.647	38.496	0.046	0.406	0.371	0.274
HOME Responsivity	10.473	0.933	10.418	10.486	-0.055	-0.055	0.089	0.536
HOME Acceptance	5.016	0.956	5.043	5.143	0.028	0.186	0.099	0.060
HOME Organization	5.016	0.956	5.043	5.143	0.028	0.082	0.063	0.197
HOME Learning Mat.	6.553	2.315	6.473	6.952	-0.080	0.108	0.213	0.612
HOME Involvement	5.096	1.280	5.158	5.288	0.062	0.115	0.094	0.222
HOME Variety	3.638	0.851	3.625	3.719	-0.013	-0.029	0.049	0.548
OMCI Total	41.027	4.034	41.344	41.539	0.318	0.234	0.356	0.510
Investment Index	**0**	**1**	**0.191**	**0.313**	**0.191**	**0.236**	**0.071**	**0.001**
Investment Factor	**0**	**1**	**0.031**	**0.297**	**0.031**	**0.116**	**0.075**	**0.119**

Note: MPAS : Maternal Postnatal Attachment Scale, MSES : Maternal Self-Efficacy Scale, OMCI: Observation for Mother Child Interaction. Adjusted coefficients are obtained from the regressions of items on the treatment indicator and its interactions with (demeaned) baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. All estimations control for child gender and age (in days). Robust and clustered standard errors at the cluster level are reported in the SE column. Anderson indices and factor scores are coded so that higher score always indicates better outcome. Investment Index : all MPAS items +all MSES items at 6 months, all HOME items at 12 and 36 months, all OMCI items at 24 months.

E Randomization Inference

Table A20: Randomization Inference on Aggregate Maternal Outcomes

	Adjusted Beta	SE	p-val	RI p-val
Mental Health Index (6m)	0.205	0.056	0.000	0.008
Mental Health Factor (6m)	0.206	0.052	0.000	0.003
Functioning Index (6m)	0.184	0.079	0.019	0.050
Functioning Factor (6m)	0.181	0.075	0.016	0.039
Mother Index (6m)	**0.211**	**0.061**	**0.001**	**0.013**
Mental Health Index (12m)	0.135	0.067	0.044	0.070
Mental Health Factor (12m)	0.170	0.053	0.001	0.007
Functioning Index (12m)	0.248	0.059	0.000	0.002
Functioning Factor (12m)	0.196	0.069	0.005	0.022
Mother Index (12m)	**0.214**	**0.071**	**0.002**	**0.011**
Mental Health Index (24m)	-0.033	0.051	0.515	0.573
Mental Health Factor (24m)	-0.002	0.057	0.970	0.967
Functioning Index (24m)	-0.095	0.077	0.219	0.314
Functioning Factor (24m)	-0.036	0.072	0.616	0.665
Mother Index (24m)	**-0.071**	**0.061**	**0.240**	**0.323**
Mental Health Index (36m)	0.325	0.090	0.000	0.004
Mental Health Factor (36m)	0.267	0.077	0.001	0.005
Functioning Index (36m)	0.220	0.074	0.003	0.012
Functioning Factor (36m)	0.287	0.080	0.000	0.006
Mother Index (36m)	**0.291**	**0.092**	**0.001**	**0.009**

Note: p-values reported in the last column are computed using randomization inference based on Young (2019) with the randomization permuted at the cluster level.

Table A21: Randomization Inference on Aggregate Child and Investment Outcomes

	Adjusted Beta	SE	p-val	RI p-val
Child Health Index (6m)	-0.055	0.067	0.419	0.455
Child Health Factor (6m)	-0.011	0.073	0.878	0.893
Child SE Index (6m)	-0.049	0.073	0.495	0.539
Child SE Factor (6m)	0.076	0.057	0.187	0.326
Investment Index (6m)	0.095	0.065	0.145	0.210
Investment Factor (6m)	0.076	0.057	0.187	0.264
Child Index (6m)	**-0.067**	**0.073**	**0.357**	**0.431**
Child Health Index (12m)	-0.031	0.063	0.623	0.650
Child Health Factor (12m)	0.015	0.067	0.824	0.824
Child SE Index (12m)	0.105	0.057	0.064	0.126
Child SE Factor (12m)	0.165	0.062	0.008	0.027
Child Cog Index (12m)	-0.050	0.070	0.471	0.526
Child Cog Factor (12m)	-0.084	0.083	0.309	0.387
Investment Index (12m)	0.142	0.075	0.059	0.124
Investment Factor (12m)	0.080	0.084	0.344	0.409
Child Index (12m)	**0.069**	**0.050**	**0.169**	**0.256**
Child Health Index (24m)	-0.082	0.077	0.290	0.364
Child Health Factor (24m)	-0.100	0.083	0.227	0.287
Child SE Index (24m)	0.054	0.071	0.453	0.496
Child SE Factor (24m)	-0.065	0.067	0.334	0.438
Investment Index (24m)	-0.045	0.084	0.592	0.640
Investment Factor (24m)	-0.031	0.083	0.710	0.744
Child Index (24m)	**0.030**	**0.074**	**0.681**	**0.718**
Child Health Index (36m)	-0.120	0.090	0.182	0.244
Child Health Factor (36m)	-0.167	0.081	0.038	0.067
Child SE Index (36m)	0.012	0.076	0.875	0.911
Child SE Factor (36m)	0.059	0.102	0.565	0.631
Child Cog Index (36m)	0.090	0.074	0.225	0.274
Child Cog Factor (36m)	0.049	0.076	0.520	0.536
Investment Index (36m)	0.079	0.071	0.264	0.313
Investment Factor (36m)	0.113	0.077	0.143	0.217
Child Index (36m)	**-0.005**	**0.079**	**0.953**	**0.965**

Note: p-values reported in the last column are computed using randomization inference based on Young (2019) with the randomization permuted at the cluster level.

F Heterogeneity in Treatment Effects

Figure A4: Coefficient Plots of Indices (Boys)

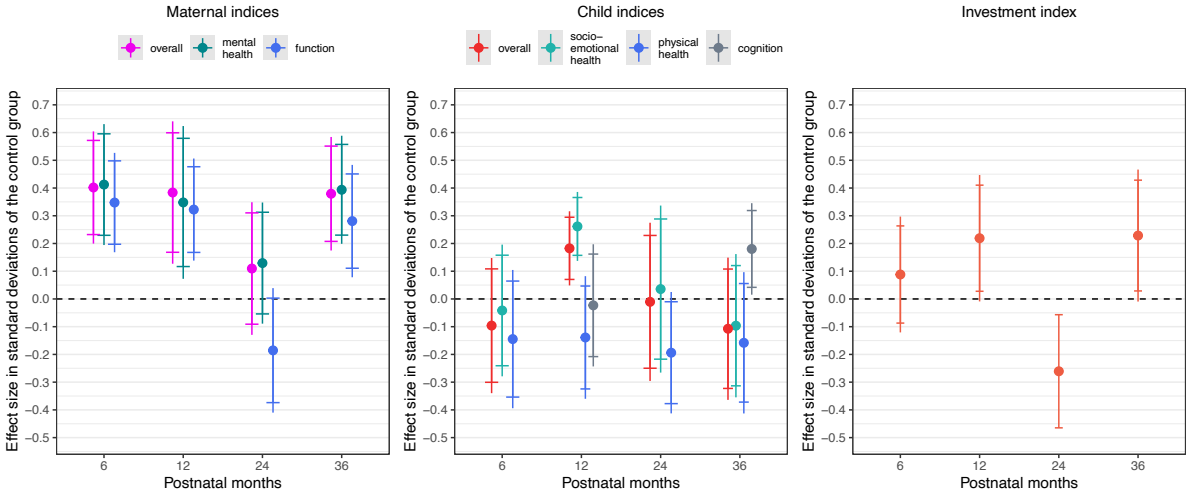


Figure A5: Coefficient Plots of Indices (Girls)

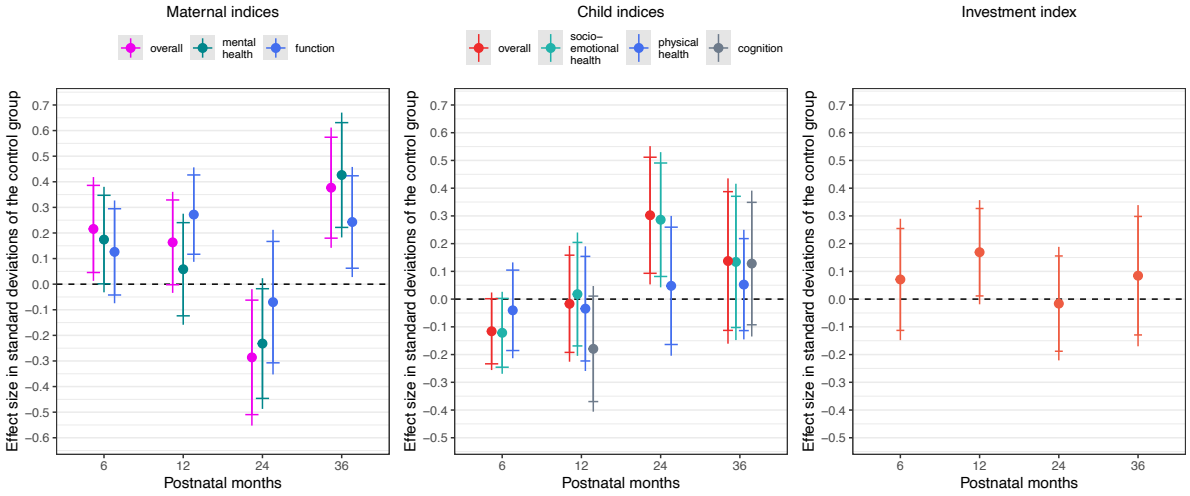


Figure A6: Coefficient Plots of Factors (Boys)

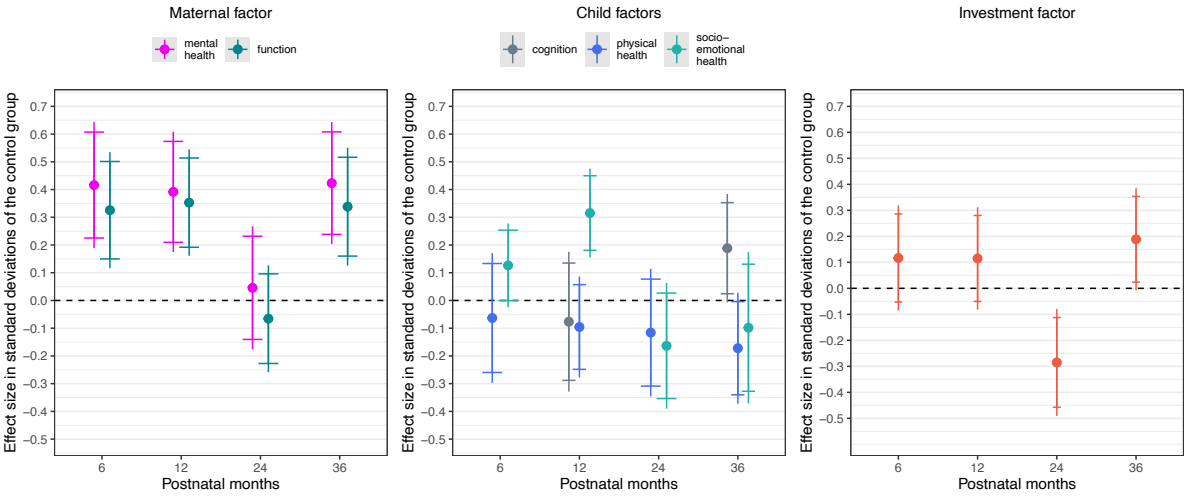


Figure A7: Coefficient Plots of Factors (Girls)

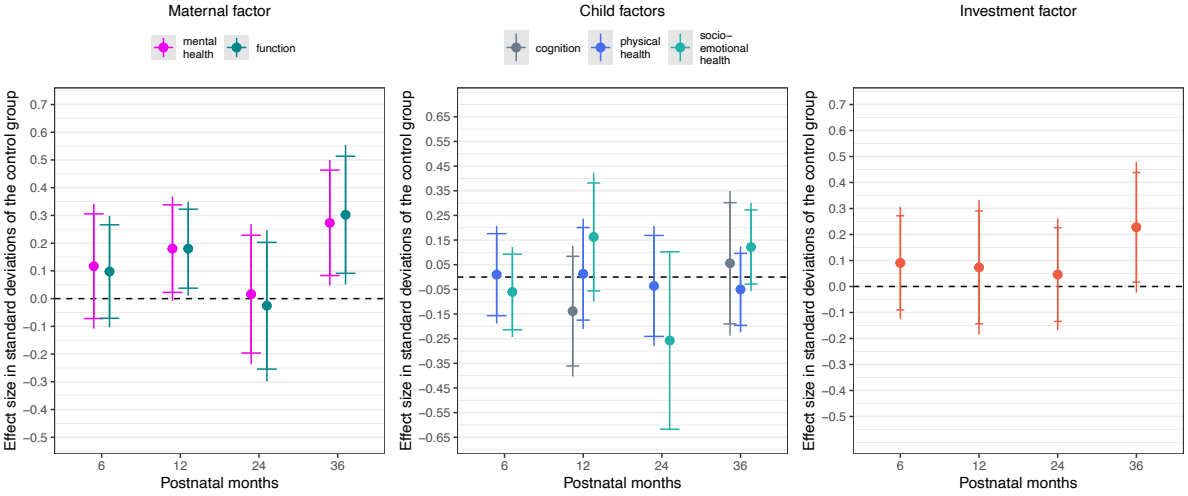
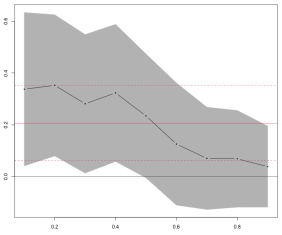
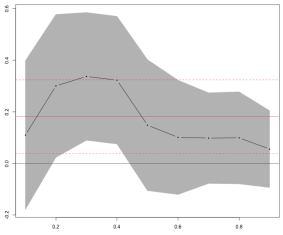


Figure A8: Quantile Treatment Effects on Latent Factors

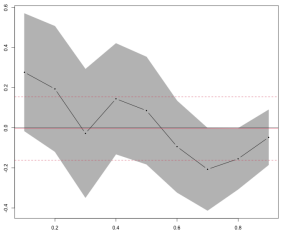
(a) Maternal mental health, 6 months



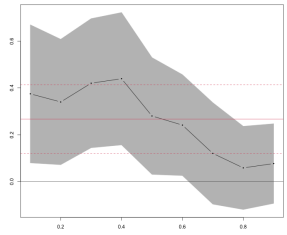
(b) Maternal mental health, 12 months



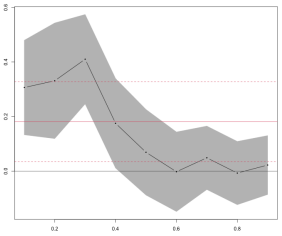
(c) Maternal mental health, 24 months



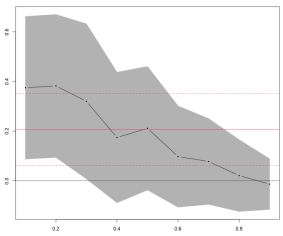
(d) Maternal mental health, 36 months



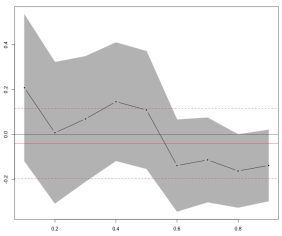
(e) Maternal func., 6 months



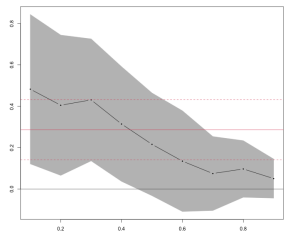
(f) Maternal func. 12 months



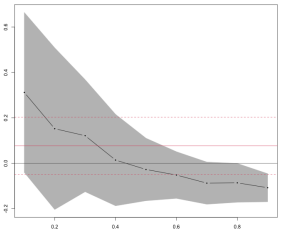
(g) Maternal func. 24 months



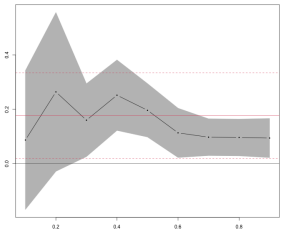
(h) Maternal func. 36 months



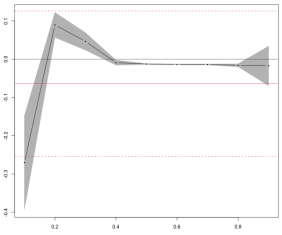
(i) Children's socioemotional skills, 6 months



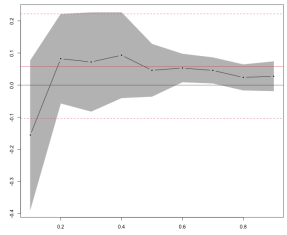
(j) Children's socioemotional skills, 12 months



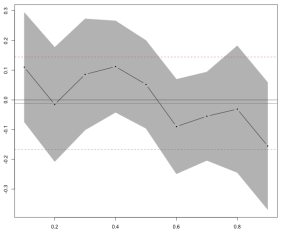
(k) Children's socioemotional skills, 24 months



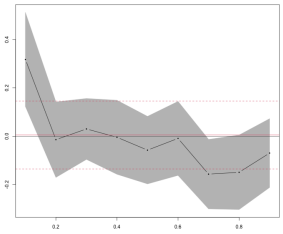
(l) Children's socioemotional skills, 36 months



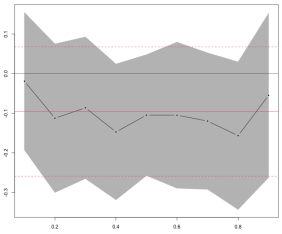
(m) Children's physical health, 6 months



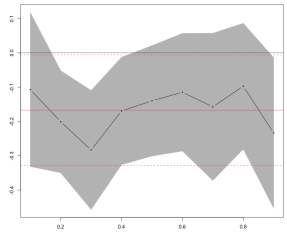
(n) Children's physical health, 12 months



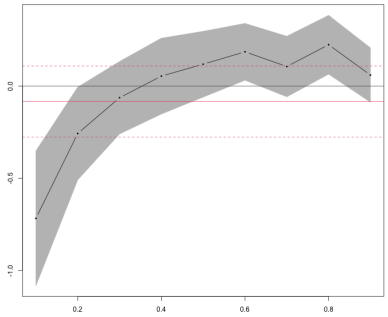
(o) Children's physical health, 24 months



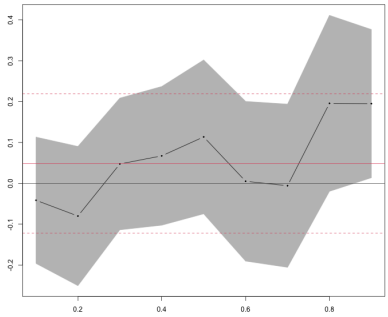
(p) Children's physical health, 36 months



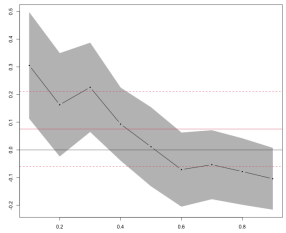
(q) Children's cognition, 12 months



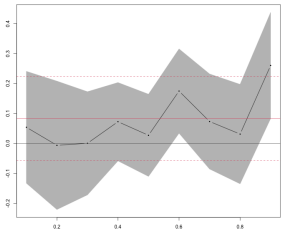
(r) Children's cognition, 36 months



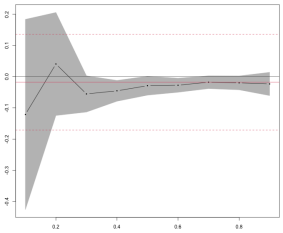
(s) Parental investment, 6 months



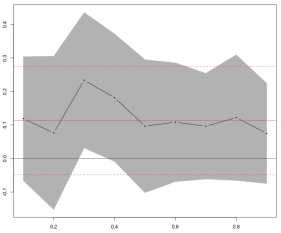
(t) Parental investment, 12 months



(u) Parental investment, 24 months



(v) Parental investment, 36 months



Note: Quantile treatment effects of THPP+ intervention on latent factors. 95 % confidence intervals are calculated by bootstrapping using 1000 replications and clustering at the level of randomization.

Table A22: Heterogeneity in treatment effects for maternal mental health

	Coefficient on		
	treatment	baseline characteristic	treat x baseline characteristic
	(1)	(2)	(3)
Baseline characteristic: index child is female			
mental health (6m)	0.344***	0.029	−0.298*
	(0.106)	(0.148)	(0.179)
mental health (12m)	0.336***	0.171	−0.352*
	(0.126)	(0.126)	(0.187)
mental health (24m)	0.104	0.124	−0.280
	(0.115)	(0.167)	(0.196)
mental health (36m)	0.315**	−0.006	−0.032
	(0.158)	(0.166)	(0.222)
Baseline characteristic: first child			
mental health (6m)	0.119	−0.238	0.298
	(0.088)	(0.194)	(0.224)
mental health (12m)	0.158	−0.027	−0.018
	(0.104)	(0.290)	(0.307)
mental health (24m)	−0.117	−0.166	0.313
	(0.094)	(0.208)	(0.228)
mental health (36m)	0.335***	0.082	−0.157
	(0.109)	(0.251)	(0.250)
Baseline characteristic: SES index			
mental health (6m)	0.230***	−0.089*	0.118**
	(0.065)	(0.050)	(0.053)
mental health (12m)	0.151**	−0.008	−0.008
	(0.072)	(0.042)	(0.053)
mental health (24m)	0.001	−0.039	0.092*
	(0.070)	(0.041)	(0.053)
mental health (36m)	0.284***	0.021	−0.040
	(0.095)	(0.042)	(0.059)
Baseline characteristic: mother's education			
mental health (6m)	−0.306**	−0.011	0.070***
	(0.139)	(0.014)	(0.020)
mental health (12m)	−0.008	0.006	0.023
	(0.189)	(0.019)	(0.024)
mental health (24m)	−0.222	−0.005	0.027
	(0.156)	(0.011)	(0.021)
mental health (36m)	0.422**	0.018	−0.018
	(0.213)	(0.018)	(0.027)

tretment=1 if the observation is in treatment clusters, =0 otherwise. Dependent variables (listed on the first column) are ICW indices of maternal mental health, coded in a way that higher score means better outcome and standardized to be mean 0 and SD 1 in the control group. Coefficients are obtained from the regressions of indices on the treatment indicator, its interactions with the respective dimension and the baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education (in years), asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE column.
Note: *p<0.1; **p<0.05; ***p<0.01

Table A23: Heterogeneity in treatment effects for selected child outcomes

	Coefficient on		
	treatment	baseline characteristic	treat x baseline characteristic
	(1)	(2)	(3)
Baseline characteristic: index child is female			
socioemotional skills (6m)	0.014	0.064	−0.110
	(0.124)	(0.135)	(0.159)
socioemotional skills (12m)	0.359***	0.282**	−0.455***
	(0.120)	(0.128)	(0.135)
socioemotional skills (24m)	0.004	0.046	0.093
	(0.150)	(0.115)	(0.181)
socioemotional skills (36m)	−0.142	−0.040	0.249
	(0.150)	(0.104)	(0.173)
cognition (12m)	0.015	−0.065	−0.078
	(0.125)	(0.150)	(0.207)
cognition (36m)	0.025	−0.089	0.116
	(0.125)	(0.103)	(0.180)
Baseline characteristic: first child			
socioemotional skills (6m)	−0.157*	−0.462*	0.487*
	(0.084)	(0.237)	(0.293)
socioemotional skills (12m)	0.171**	0.142	−0.200
	(0.087)	(0.166)	(0.188)
socioemotional skills (24m)	−0.001	−0.050	0.208
	(0.125)	(0.191)	(0.258)
socioemotional skills (36m)	0.093	0.324**	−0.461**
	(0.107)	(0.143)	(0.219)
cognition (12m)	−0.099	−0.142	0.316
	(0.099)	(0.189)	(0.213)
cognition (36m)	0.102	−0.115	−0.072
	(0.093)	(0.155)	(0.221)
Baseline characteristic: SES index			
socioemotional skills (6m)	−0.033	0.026	0.028
	(0.079)	(0.046)	(0.051)
socioemotional skills (12m)	0.149**	−0.035	0.062
	(0.070)	(0.052)	(0.052)
socioemotional skills (24m)	0.072	−0.027	0.048
	(0.094)	(0.040)	(0.060)
socioemotional skills (36m)	−0.016	0.009	−0.008
	(0.095)	(0.067)	(0.076)
cognition (12m)	0.027	−0.046	0.129*
	(0.081)	(0.064)	(0.075)
cognition (36m)	0.092	−0.038	0.020
	(0.087)	(0.044)	(0.052)
Baseline characteristic: mother's education			
socioemotional skills (6m)	−0.340**	−0.040**	0.042*
	(0.156)	(0.019)	(0.024)
socioemotional skills (12m)	0.026	−0.004	0.014
	(0.155)	(0.019)	(0.021)
socioemotional skills (24m)	−0.064	−0.001	0.017
	(0.259)	(0.014)	(0.033)
socioemotional skills (36m)	0.112	0.026	−0.018
	(0.203)	(0.019)	(0.024)
cognition (12m)	−0.425**	−0.003	0.057**
	(0.205)	(0.022)	(0.024)
cognition (36m)	0.232	0.041***	−0.021
	(0.150)	(0.014)	(0.022)

tretment=1 if the observation is in treatment clusters, =0 otherwise. Dependent variables (listed on the first column) are ICW indices of child socio-emotional health and cognition, coded in a way that higher score means better outcome and standardized to be mean 0 and SD 1 in the control group. Coefficients are obtained from the regressions of indices on the treatment indicator, its interactions with the respective dimension and the baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education (in years), asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE column.

Note: *p<0.1; **p<0.05; ***p<0.01

Table A24: Heterogeneity in treatment effects for parental investment

	Coefficient on		
	treatment	baseline characteristic	treat x baseline characteristic
	(1)	(2)	(3)
Baseline characteristic: index child is female			
parental investment (6m)	0.052	0.117	0.087
	(0.103)	(0.117)	(0.141)
parental investment (12m)	0.186	−0.024	−0.093
	(0.133)	(0.165)	(0.208)
parental investment (24m)	−0.198	−0.069	0.259
	(0.143)	(0.137)	(0.187)
parental investment (36m)	0.100	0.015	−0.044
	(0.155)	(0.159)	(0.215)
Baseline characteristic: first child			
parental investment (6m)	0.045	−0.186	0.220
	(0.083)	(0.158)	(0.208)
parental investment (12m)	0.102	−0.041	0.152
	(0.106)	(0.141)	(0.231)
parental investment (24m)	−0.045	−0.002	−0.082
	(0.117)	(0.168)	(0.244)
parental investment (36m)	0.179*	0.013	−0.441
	(0.102)	(0.148)	(0.281)
Baseline characteristic: SES index			
parental investment (6m)	0.087	0.030	−0.029
	(0.071)	(0.044)	(0.059)
parental investment (12m)	0.128	0.066	−0.024
	(0.089)	(0.048)	(0.045)
parental investment (24m)	−0.088	0.056	−0.051
	(0.091)	(0.063)	(0.072)
parental investment (36m)	0.068	0.151***	−0.027
	(0.082)	(0.050)	(0.054)
Baseline characteristic: mother's education			
parental investment (6m)	0.116	0.022	−0.003
	(0.163)	(0.018)	(0.022)
parental investment (12m)	0.080	0.039**	0.008
	(0.170)	(0.016)	(0.019)
parental investment (24m)	0.208	0.058***	−0.040
	(0.252)	(0.019)	(0.029)
parental investment (36m)	0.108	0.015	−0.005
	(0.164)	(0.013)	(0.022)

tretment=1 if the observation is in treatment clusters, =0 otherwise. Dependent variables (listed on the first column) are ICW indices of parental investment, coded in a way that higher score means better outcome and standardized to be mean 0 and SD 1 in the control group. Coefficients are obtained from the regressions of indices on the treatment indicator, its interactions with the respective dimension and the baseline covariates including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education (in years), asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE column.
Note: *p<0.1; **p<0.05; ***p<0.01

G Depression Gap

Table A25: Difference on ICW Indices between Non-depressed and Control Groups

	treated depressed-control depressed				nondepressed-control depressed			
	Diff. (T-C)	Adjusted Beta	SE	p-val	Diff. (ND-C)	Adjusted Beta	SE	p-val
Maternal Indices								
Mental Health (6m)	0.142	0.163	0.084	0.053	0.516	-0.026	0.186	0.889
Mental Health (12m)	0.103	0.142	0.085	0.096	0.478	0.090	0.148	0.542
Mental Health (24m)	-0.139	-0.048	0.079	0.541	0.328	-0.150	0.169	0.374
Mental Health (36m)	0.168	0.292	0.098	0.003	0.425	0.067	0.162	0.681
Functioning (6m)	0.136	0.175	0.088	0.047	0.459	0.057	0.157	0.715
Functioning (12m)	0.192	0.241	0.077	0.002	0.378	-0.344	0.201	0.087
Functioning (24m)	-0.087	-0.095	0.097	0.332	0.303	-0.344	0.166	0.038
Functioning (36m)	0.066	0.211	0.079	0.008	0.317	-0.157	0.184	0.393
Child Indices								
Physical Health (6m)	0.001	-0.021	0.096	0.826	-0.020	0.054	0.194	0.779
Physical Health (12m)	0.012	0.002	0.080	0.981	-0.016	-0.140	0.196	0.475
Physical Health (24m)	-0.097	-0.035	0.095	0.710	0.004	0.195	0.185	0.293
Physical Health (36m)	-0.099	-0.099	0.099	0.315	0.045	-0.169	0.185	0.361
Socioemotional Skills (6m)	-0.034	-0.046	0.085	0.589	0.041	-0.239	0.173	0.166
Socioemotional Skills (12m)	0.106	0.100	0.081	0.215	0.050	-0.254	0.197	0.197
Socioemotional Skills (24m)	-0.043	0.046	0.089	0.604	-0.162	-0.281	0.184	0.126
Socioemotional Skills (36m)	0.022	-0.024	0.118	0.842	0.240	-0.111	0.133	0.404
Cognition (12m)	-0.038	-0.040	0.105	0.704	0.038	-0.151	0.196	0.442
Cognition (36m)	0.092	0.104	0.088	0.235	0.074	-0.112	0.155	0.473
Investment Indices								
Parental Investment (6m)	0.083	0.085	0.071	0.228	0.180	-0.289	0.187	0.123
Parental Investment (12m)	0.131	0.160	0.086	0.064	0.262	0.106	0.204	0.604
Parental Investment (24m)	-0.076	-0.045	0.093	0.626	0.166	-0.181	0.192	0.345
Parental Investment (36m)	0.060	0.082	0.080	0.301	0.179	0.052	0.207	0.801

Column 3 reports the adjusted treatment coefficient from the regression of indices on treatment indicator and its interaction with the (demeaned) baseline covariates using the experimental sample. Column 7 reports the adjusted coefficient from the regression of indices on an indicator of being baseline non-depressed and its interaction with the (demeaned) baseline covariates using the sample of non-depressed and control depressed mothers. Baseline covariates include baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE columns. ICW indices are coded so that higher score indicates better outcome and standardized to have mean 0 and SD 1 in the control group.

Table A26: Difference on Factor Scores between Non-depressed and Control Groups

	treated depressed-control depressed				nondepressed-control depressed			
	Diff. (T-C)	Adjusted Beta	SE	p-val	Diff. (ND-C)	Adjusted Beta	SE	p-val
Maternal Factors								
Mental Health (6m)	0.161	0.197	0.063	0.002	0.647	-0.160	0.188	0.396
Mental Health (12m)	0.095	0.164	0.075	0.029	0.642	-0.340	0.148	0.022
Mental Health (24m)	0.028	-0.007	0.080	0.928	0.532	-0.205	0.171	0.229
Mental Health (36m)	0.134	0.270	0.099	0.006	0.553	-0.136	0.178	0.444
Functioning (6m)	0.108	0.170	0.087	0.051	0.543	0.028	0.174	0.871
Functioning (12m)	0.157	0.184	0.086	0.033	0.469	-0.377	0.209	0.071
Functioning (24m)	-0.013	-0.028	0.086	0.743	0.406	-0.286	0.177	0.107
Functioning (36m)	0.118	0.280	0.094	0.003	0.377	-0.177	0.194	0.360
Child Factors								
Physical Health (6m)	-0.020	0.009	0.092	0.926	-0.015	-0.040	0.175	0.820
Physical Health (12m)	0.047	0.033	0.084	0.698	0.064	-0.128	0.151	0.394
Physical Health (24m)	-0.130	-0.064	0.099	0.521	0.053	0.019	0.164	0.910
Physical Health (36m)	-0.120	-0.141	0.094	0.133	0.040	-0.088	0.171	0.609
Socioemotional Skills (6m)	0.050	0.082	0.080	0.305	-0.028	-0.134	0.163	0.412
Socioemotional Skills (12m)	0.157	0.156	0.089	0.081	0.111	-0.326	0.196	0.096
Socioemotional Skills (24m)	-0.050	-0.045	0.084	0.589	-0.217	-0.295	0.198	0.137
Socioemotional Skills (36m)	0.025	0.075	0.122	0.540	0.147	-0.083	0.145	0.570
Cognition (12m)	-0.064	-0.065	0.115	0.575	0.064	-0.144	0.190	0.449
Cognition (36m)	0.036	0.060	0.087	0.492	-0.030	-0.252	0.167	0.132
Investment Factors								
Parental Investment (6m)	0.060	0.064	0.068	0.345	0.417	-0.373	0.208	0.073
Parental Investment (12m)	0.062	0.109	0.093	0.239	0.447	-0.128	0.194	0.509
Parental Investment (24m)	0.012	-0.042	0.093	0.651	0.035	-0.449	0.122	0.000
Parental Investment (36m)	0.070	0.114	0.087	0.189	0.365	-0.017	0.175	0.925

Column 3 reports the adjusted treatment coefficient from the regression of factors on treatment indicator and its interaction with the (demeaned) baseline covariates using the experimental sample. Column 7 reports the adjusted coefficient from the regression of factors on an indicator of being baseline non-depressed and its interaction with the (demeaned) baseline covariates using the sample of non-depressed and control depressed mothers. Baseline covariates include baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect and days from baseline. Robust and clustered standard errors at the cluster level are reported in the SE columns. Latent factor scores are coded so that higher score indicates better outcome and standardized to have mean 0 and SD 1 in the control group.

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Table A27: Estimates of the Production Function Controlling for the Baseline Mental Health (12 months)

	Socioemotional skills (12m)	Physical health (12m)	Cognition (12m)	Parental investment (12m)
	(1)	(2)	(3)	(4)
SE skills (6m)	0.542***	0.003	0.057*	0.040
	(0.049)	(0.013)	(0.034)	(0.029)
physical health (6m)	0.042	0.928***	0.111***	0.077***
	(0.037)	(0.014)	(0.042)	(0.024)
mother mental health (6m)	0.119*	0.083***	0.130*	−0.114*
	(0.063)	(0.030)	(0.076)	(0.069)
mother general health (6m)	−0.040	−0.044**	−0.024	0.080**
	(0.053)	(0.020)	(0.045)	(0.040)
investment (12m)	0.050	0.030	−0.014	
	(0.083)	(0.022)	(0.060)	
Interactions				
mother MH (6m) x treat	−0.216***	−0.061	−0.198**	0.100
	(0.078)	(0.038)	(0.096)	(0.085)
mother MH (6m) x nondep.	−0.060	−0.133***	−0.065	0.106
	(0.097)	(0.034)	(0.094)	(0.080)
investment (12m) x treat	0.104	−0.030	0.343***	
	(0.106)	(0.035)	(0.090)	
investment (12m) x nondep.	−0.011	−0.026	0.205***	
	(0.084)	(0.030)	(0.073)	
Total factor productivity (TFP)				
TFP	−0.639	−0.466	4.199***	0.105
	(0.912)	(0.346)	(0.918)	(0.798)
TFP x treat	0.480***	0.034*	−0.025	0.062
	(0.060)	(0.020)	(0.058)	(0.060)
TFP x nondep.	0.267***	0.118***	−0.072	0.023
	(0.098)	(0.038)	(0.088)	(0.094)
Baseline controls				
SES assets	−0.017	0.004	0.009	0.087***
	(0.019)	(0.007)	(0.024)	(0.016)
mother's education (years)	−0.001	0.005	−0.004	0.018***
	(0.064)	(0.003)	(0.007)	(0.004)
husband's education (years)	0.001	−0.006**	−0.001	0.017**
	(0.007)	(0.003)	(0.006)	(0.008)
Observations	932	932	927	932
R2	0.505	0.882	0.257	0.385
Adjusted R2	0.467	0.873	0.201	0.341

SE= socioemotional skills, MH=mental health. Dependent variables are child outcomes and parental investment factors at 12 months postpartum. Independent variables include an indicator of treatment status (control, treatment, non-depressed), child and maternal factors at 6 months, parental investment factor at 12 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.
Note: *p<0.1; **p<0.05; ***p<0.01

Table A28: Estimates of the Production Function Controlling for the Baseline Mental Health (36 months)

	Socioemotional skills (36m)	Physical health (36m)	Cognition (36m)	Parental investment (36m)
	(1)	(2)	(3)	(4)
SE skills (12m)	0.241***	0.035*	0.012	−0.083**
	(0.036)	(0.019)	(0.023)	(0.032)
physical health (12m)	0.027	1.049***	0.046**	0.066**
	(0.041)	(0.026)	(0.023)	(0.029)
cognition (12m)	0.001	−0.018	0.059***	0.031
	(0.038)	(0.022)	(0.022)	(0.033)
mother mental health (12m)	0.078	0.045	−0.074	0.202***
	(0.096)	(0.050)	(0.059)	(0.076)
mother general health (12m)	−0.070	−0.049*	0.065*	−0.009
	(0.048)	(0.027)	(0.033)	(0.049)
investment (36m)	0.164**	0.001	0.092**	
	(0.069)	(0.039)	(0.039)	
Interactions				
mother MH (12m) x treat	0.049	−0.057	0.059	−0.150*
	(0.114)	(0.056)	(0.066)	(0.085)
mother MH (12m) x nondep.	0.003	−0.004	−0.005	−0.074
	(0.112)	(0.047)	(0.068)	(0.087)
investment (36m) x treat	−0.188*	0.036	−0.085	
	(0.109)	(0.054)	(0.060)	
investment (36m) x nondep.	0.013	−0.048	−0.008	
	(0.100)	(0.045)	(0.051)	
Total factor productivity (TFP)				
TFP	0.570	−1.537**	1.966**	1.895
	(2.474)	(0.698)	(0.949)	(1.376)
TFP x treat	−0.115	−0.170***	0.019	0.131**
	(0.084)	(0.045)	(0.039)	(0.059)
TFP x nondep.	−0.178	0.038	−0.046	0.122
	(0.122)	(0.060)	(0.072)	(0.092)
Baseline controls				
SES assets	−0.016	−0.004	−0.002	0.055***
	(0.016)	(0.012)	(0.011)	(0.019)
mother's education (years)	−0.006	0.006	0.014***	0.016***
	(0.006)	(0.004)	(0.004)	(0.006)
husband's education (years)	0.009	−0.003	0.008	0.031***
	(0.007)	(0.004)	(0.006)	(0.008)
Observations	881	881	881	881
R2	0.422	0.839	0.302	0.313
Adjusted R2	0.382	0.828	0.253	0.268

SE= socioemotional skills, MH=mental health. Dependent variables are child outcomes and parental investment factors at 36 months postpartum. Independent variables include an indicator of treatment status (control, treatment, nondepressed), child and maternal factors at 12 months, parental investment factor at 36 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (split by gender), whether the index child is the first child, parental education levels, asset based SES index, life events cheklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.
Note: *p<0.1; **p<0.05; ***p<0.01

Table A29: Estimates of the Production Function and Investment Equation by Gender (12 months)

	Boys				Girls			
	Socioemotional skills (12m)	Physical health (12m)	Cognition (12m)	Parental investment (12m)	Socioemotional skills (12m)	Physical health (12m)	Cognition (12m)	Parental investment (12m)
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
SE skills (6m)	0.536***	−0.022	0.051	0.035	0.560***	0.032	0.070	0.040
	(0.067)	(0.020)	(0.053)	(0.048)	(0.047)	(0.020)	(0.050)	(0.040)
physical health (6m)	0.058	0.917***	0.134**	0.100***	0.046	0.935***	0.103*	0.043
	(0.057)	(0.019)	(0.063)	(0.029)	(0.041)	(0.022)	(0.054)	(0.044)
mother mental health (6m)	0.060	0.066	0.170	−0.034	0.112	0.093**	0.063	−0.219**
	(0.129)	(0.046)	(0.133)	(0.100)	(0.111)	(0.039)	(0.083)	(0.096)
mother functioning (6m)	−0.023	−0.013	−0.038	0.102*	−0.057	−0.048**	0.003	0.051
	(0.119)	(0.032)	(0.068)	(0.050)	(0.062)	(0.023)	(0.060)	(0.066)
investment (12m)	0.085	0.017	−0.189*		−0.011	0.046*	0.036	
	(0.119)	(0.045)	(0.102)		(0.122)	(0.028)	(0.085)	
Interactions								
mother MH (6m) x treat	−0.125	−0.025	−0.068	−0.020	−0.241**	−0.077	−0.264**	0.227*
	(0.148)	(0.055)	(0.179)	(0.122)	(0.119)	(0.052)	(0.126)	(0.134)
mother MH (6m) x nondep.	0.005	−0.155***	−0.098	−0.035	−0.109	−0.118**	−0.050	0.299***
	(0.166)	(0.055)	(0.140)	(0.124)	(0.116)	(0.052)	(0.088)	(0.106)
investment (12m) x treat	0.056	−0.020	0.260*		0.114	−0.045	0.451***	
	(0.165)	(0.058)	(0.144)		(0.148)	(0.046)	(0.155)	
investment (12m) x nondep.	−0.016	−0.007	0.289**		0.042	−0.047	0.233**	
	(0.117)	(0.060)	(0.114)		(0.118)	(0.041)	(0.116)	
Total factor productivity (TFP)								
TFP	−0.114	−0.607	4.065***	0.303	−1.102	−0.628	3.495**	−0.016
	(1.403)	(0.536)	(1.265)	(0.855)	(1.123)	(0.486)	(1.459)	(1.285)
TFP x treat	0.571***	0.031	−0.030	0.080	0.411***	0.038	−0.030	0.059
	(0.105)	(0.027)	(0.084)	(0.070)	(0.083)	(0.026)	(0.092)	(0.092)
TFP x nondep.	0.286*	0.136**	−0.252*	−0.027	0.169	0.134**	−0.047	0.084
	(0.162)	(0.054)	(0.150)	(0.122)	(0.123)	(0.056)	(0.123)	(0.143)
Baseline controls								
SES assets	−0.059*	0.017	−0.014	0.074***	0.017	−0.009	0.046	0.106***
	(0.031)	(0.013)	(0.032)	(0.021)	(0.020)	(0.011)	(0.033)	(0.024)
mother's education (years)	0.009	0.005	−0.005	0.019***	−0.002	0.004	−0.003	0.016*
	(0.010)	(0.005)	(0.011)	(0.006)	(0.007)	(0.003)	(0.009)	(0.008)
husband's education (years)	−0.006	−0.012**	−0.001	0.015*	0.006	−0.001	−0.001	0.015
	(0.012)	(0.005)	(0.010)	(0.009)	(0.009)	(0.004)	(0.009)	(0.011)
Observations	466	466	464	466	466	466	463	466
R2	0.507	0.898	0.278	0.482	0.589	0.882	0.343	0.358
Adjusted R2	0.431	0.882	0.166	0.407	0.527	0.864	0.243	0.266

SE= socioemotional skills, MH=mental health. Table shows estimates of the production function at 12 months by the gender of the index child. Dependent variables are child outcomes and parental investment factors at 12 months postpartum. Independent variables include an indicator of treatment status (control, treatment, nondepressed), child and maternal factors at 6 months, parental investment factor at 12 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (splitted by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.
Note: *p<0.1; **p<0.05; ***p<0.01

Table A30: Estimates of the Production Function and Investment Equation by Gender (36 months)

	Boys				Girls			
	Socioemotional skills (36m)	Physical health (36m)	Cognition (36m)	Parental investment (36m)	Socioemotional skills (36m)	Physical health (36m)	Cognition (36m)	Parental investment (36m)
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
SE skills (12m)	0.250***	0.046*	−0.011	−0.045	0.272***	0.027	0.036	−0.129***
	(0.060)	(0.028)	(0.027)	(0.042)	(0.053)	(0.026)	(0.033)	(0.038)
physical health (12m)	0.037	1.017***	0.043	0.101***	−0.008	1.076***	0.041	0.022
	(0.061)	(0.034)	(0.038)	(0.035)	(0.046)	(0.029)	(0.033)	(0.048)
cognition (12m)	−0.011	−0.009	0.109***	0.055	−0.006	−0.028	0.018	0.015
	(0.074)	(0.034)	(0.031)	(0.038)	(0.042)	(0.033)	(0.032)	(0.049)
mother mental health (12m)	0.313**	−0.004	−0.050	0.391***	−0.062	0.080	−0.124*	0.054
	(0.135)	(0.093)	(0.074)	(0.125)	(0.113)	(0.061)	(0.077)	(0.082)
mother functioning (12m)	−0.095	−0.069*	0.082*	−0.020	−0.025	−0.035	0.054	−0.015
	(0.083)	(0.040)	(0.049)	(0.072)	(0.060)	(0.045)	(0.039)	(0.066)
investment (36m)	0.024	−0.044	0.135**		0.283**	0.069	0.068	
	(0.107)	(0.076)	(0.062)		(0.115)	(0.051)	(0.067)	
Interactions								
mother MH (12m) x treat	−0.072	0.076	0.101	−0.375***	0.161	−0.161**	0.084	0.010
	(0.197)	(0.102)	(0.097)	(0.137)	(0.156)	(0.072)	(0.075)	(0.128)
mother MH (12m) x nondep.	−0.248	0.076	−0.009	−0.380***	0.113	−0.060	0.032	0.206*
	(0.153)	(0.078)	(0.087)	(0.128)	(0.138)	(0.063)	(0.097)	(0.110)
investment (36m) x treat	−0.032	0.086	−0.073		−0.302*	0.003	−0.114	
	(0.160)	(0.096)	(0.075)		(0.172)	(0.063)	(0.096)	
investment (36m) x nondep.	0.088	−0.021	−0.070		−0.075	−0.113*	0.041	
	(0.149)	(0.084)	(0.076)		(0.134)	(0.058)	(0.089)	
Total factor productivity (TFP)								
TFP	−1.226	−2.654**	−0.702	1.761	3.063	−1.168	4.897***	1.299
	(3.612)	(1.288)	(1.540)	(1.727)	(2.538)	(1.203)	(1.150)	(2.177)
TFP x treat	−0.194	−0.182***	0.024	0.119	−0.078	−0.154***	0.031	0.165**
	(0.129)	(0.062)	(0.064)	(0.083)	(0.112)	(0.056)	(0.053)	(0.070)
TFP x nondep.	−0.310*	−0.011	−0.009	0.161	−0.102	0.114	−0.084	0.063
	(0.167)	(0.075)	(0.092)	(0.145)	(0.131)	(0.088)	(0.122)	(0.129)
Baseline controls								
SES assets	−0.034	−0.012	−0.003	0.031	0.008	−0.002	0.009	0..074***
	(0.028)	(0.016)	(0.017)	(0.027)	(0.022)	(0.017)	(0.014)	(0.026)
mother's education (years)	−0.008	0.008	0.014**	0.022***	−0.005	0.005	0.011**	0.011
	(0.009)	(0.005)	(0.006)	(0.007)	(0.010)	(0.006)	(0.005)	(0.008)
husband's education (years)	0.017	−0.006	0.004	0.047***	0.008	0.004	0.013	0.020*
	(0.014)	(0.006)	(0.007)	(0.011)	(0.010)	(0.006)	(0.009)	(0.011)
Observations	442	442	442	442	439	439	439	439
R2	0.421	0.851	0.374	0.360	0.505	0.850	0.332	0.346
Adjusted R2	0.339	0.830	0.284	0.275	0.433	0.828	0.234	0.256

SE= socioemotional skills, MH=mental health. Table shows estimates of the production function at 36 months by the gender of the index child. Dependent variables are child outcomes and parental investment factors at 36 months postpartum. Independent variables include an indicator of treatment status (control, treatment, nondepressed), child and maternal factors at 12 months, parental investment factor at 36 months. Maternal mental health and parental investment are interacted with the treatment status. All estimations control for baseline characteristics including baseline PHQ Total, baseline Whodas Total, baseline PSS Total, mother's baseline age, weight, height, waist circumference and blood pressure, family structure, grandmother being resident, total adults in the household, people per room, number of living children (splitted by gender), whether the index child is the first child, parental education levels, asset based SES index, life events checklist score, interviewer fixed effect, union council fixed effect, days from baseline and child age in days. Robust and clustered standard errors at the cluster level are reported in paranthesis.
Note: *p<0.1; **p<0.05; ***p<0.01