Mother education and children's well-being: evidence from four Pacific countries

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Abstract

We study the relationship between maternal education and children's well-being in four Pacific countries. We exploit the richness of MICS dataset to investigate such relationships and the potential mechanism behind. We find that mother's year of schooling positively correlates with likelihood of overweight and Early Childhood Development Indicator score while negatively correlates with the probability of having stunted children. We also find that the results vary across countries where the results are mainly driven by Kiribati and Samoa samples. Our further investigation reveals that years of schooling indirectly affect these outcomes via better caring practice and enrolment to early childhood education (ECE). We collect evidence that suggest potentially direct effects of year of schooling on stunting outcome. Policy wise, this paper shown that improving access to education to the women population per se has limited effect in the context of a developing country. Our results advocate for disseminating specific maternal and parenting knowledge and improving ECE access as an effective policy to improve child well-being in the Pacific area.

Keywords: labor market entrants, unemployment rate, scarring, Asian Financial Crisis, gender economics.

JEL Classification: J16, J24, J64, O17

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1 Introduction

Our study investigates women empowerment, as measured by mother's education, and children's well-being across four countries in the Pacific regions: Tonga, Kiribati, Samoa, and Tuvalu. We focus on small-island economies in the Pacific given their unique economic, geographic and socio-cultural challenges and opportunities. In particular, as most of Pacific countries has high and frequent natural disaster, human capital accumulation becomes even more important as to physical or capital investment. This study looks into both the health and educational well-being of the children, as well as explores potential intermediary effects of mothers as a way to understand the mechanism behind. The latter is carried out by testing the hypothesis that a well educated mother would positively associate with better childcare practice as well as better mother well-being, which then will have an influence on children's well-being.

Although Pacific women and girls make enormous contributions to their societies and economies and have a tremendous impact on economic growth and well-being, they have to face significant challenges. Pacific countries are among the worst in terms of violence against women incidence, including domestic violence. As many as 60 percent of women and girls have been subjected to violence by intimate partners or family members. Moreover, according to ILO (2019), for jobs outside of agriculture, men outnumber women roughly two to one, and they also earn 20 to 50 percent more. Large informal and subsistence economies characterize the labour market across the Pacific, with a significant share of the workforce (about 25 percent) work in vulnerable employment. The vast number of women engaged in subsistence agriculture with minimum income security and social protection. Furthermore, Penning de Vries et al. (2022) estimates that GDP per capita in the long run would be almost 20 percent higher if female employment were exogenously increased to be the same as men.

In regard to children's outcome, nutrition and education status of Pacific children are relatively lower compared to other developing countries. Many households were already struggling to provide enough nutritious food to their children before the epidemic hit due to conflict, natural disasters, and climate change, with one in every three children under five suffering from malnutrition. According to data from the World Bank (2021), the prevalence of children suffering from stunting in the Pacific is 38.4 percent, higher than Asia (31.7), Eastern Africa (34.5) and Middle Africa (31.5 percent). Moreover, anemia prevalence in children in the Pacific is considerably high, with prevalence ranging from 12.3 percent to over 70 percent.

Countries in the Pacific also experience limited progress in universal primary education, and even decline in net enrolment rates (Kiribati).

Among many ways to promote gender equality and women empowerment, the importance of education cannot be overstated. This study contributes to the lack of literature and empirical findings on maternal education and economic opportunity and children well-being, particularly in the Pacific region, as well as to provide evidence for the policymakers to invest more in women or mothers. Investing in women has a profound impact, not only on their family, but also on communities and countries, by leading healthier and more productive lives to build better futures for themselves and their family.

A plethora of studies suggest a positive relationship between women empowerment and economic development in either direction (Duflo, 2012). Investing in women improves the well-being of families. Improving women's education leads to better quality child-care (nurture effect) which leads to improved child welfare and health in both short-run and long run (Chen and Li, 2009). At the household level, improved education attainment for women increases the labor market access for women which also leads to additional resources to be allocated for children investment within a household. Improving education could also lead to higher bargaining power within households for the women which also affects the household allocation toward children (Doss, 2013).

Motivated with the aforementioned context, we aim to answer two main research questions: (1) Does mother's education have a positive association to the improvement of child well-being? (2) What is the mechanism behind the improvement of child well-being if any? If not, what could be the factors that hinder such mediation relationships? As our study is non-causal, we focus on looking at the mechanism behind how improvement in education would improve children's well-being. Answers to these questions, we believe would help policymakers to design an effective policy to improve children well-being in the country of study

This paper contributes to the literature in the Pacific regions in three ways. First, our paper, to our knowledge, is the first systematic effort to provide evidence of the effect of maternal education on child well-beings. Second, we complement previous studies on using mediation framework to examine mother-children relationship using rich household survey data. Third, our paper provides unique cross-country insights using multiple country dataset. Lastly, our paper also contributes to the literature, in particular, by serving empircal evidence

of the relationship between maternal education and child well-being when access to education for women already high.

Using the richness of Multiple Indicator Clustering Survey (MICS) dataset, we investigate the role of year of schooling on child well-being as measured by three outcomes: stunting incidence, overweight incidence and ECDI score. Overall, we find that year of schooling has negative correlation to stunting incidence. On the contrary, it has a positive correlation to ECD score and being overweight. Further analysis shows the effect varies across countries.

We examine further potential mechanisms behind the role of year of schooling on child well-being outcomes. We find that providing ECE education and better care practice as two important mediating factors that explain indirect effects of year of schooling. We further find suggestive evidence that year of schooling has positive direct effects to stunting, arguably via nutritional knowledge which is not fully captured by the mediating factors.

We structure the rest of our paper as follows. The next section lays out the importance of nurture over nature in predicting children's well being. This section lays out the specific challenges in the Pacific region in terms of children's well being. In the third section, we describe the survey dataset used in main analysis and the main variables. We discuss our main estimation strategy in the fourth section. The fifth section present and discuss the main results. Section 6 concludes our research.

2 Context

2.1 Nurture framework

Previous studies provides compelling evidence that show signifcant well-being gaps between children from high socioeconomic status family and their counterparts from low economic status family. positive association between mother education and children's well being especiall health status. Glewwe (1999), Chen and Li (2009) and more recent studies by Rubio-Codina and Grantham-McGregor (2019); Cuartas and McCoy (2021) show that there is possitive association between mother education and own children well-being. After controlling for parent's health status (nature), they find that more educated parents provides better health-care and nutrition that lead to lower incidence of stunting and malnutrition. Furthermore, well educated mother also found to practice more hygiene child care and provide safer environments (Currie and Moretti, 2003; Thomas et al., 1990). Thus, most of previous studies

advocate for nurture as key mechanism behind positive association between children well-being and wealth status of their original household as opposed to nature mechanism.

Nevertheless, a body of nutritional literature also show mixed results in regards to the relationship between maternal education and overweight incidence. On one hand, previous literature show positive association between low economic status and overweight incidence. They find that children of a household with single-mother (Gibson et al., 2007), of an obese mother (Hesketh et al., 2007) and of a low family income (Gibson et al., 2016). This low economic status indirectly implies a lower educated mother. However, there have been growing literature show negative correlation between maternal education and child's obesity. Studies in China (Feng et al., 2019), Sub-Saharan Africa (Makoka and Masibo, 2015), and South America. Maternal education might affect child obesity via the employment channel (Fertig et al., 2009). While, higher employment translates to higher calorie intake via income effect, it would also affect feeding style such as: more take-away consumption and eating while watching TV. Maternal education and child obesity may also be interconnected via excessive early breastfeeding practice Feng et al. (2019). Lastly, maternal education sorts them to specific occupations which require less physical activities. This potentially also correlates with less physical activities within the household.

Beyond health status, positive association between mother well-being and education also evident on their children cognitive and emotional development perspectives. Maternal education associated with child cognitive development via better knowledge on educational choice. Meanwhile, psychological literature suggest direct link between maternal well-being to child well-being. Mother's happiness is found to be a good predictor of child cognitive and emotional outcomes (Amato, 1994; Berger and Spieß, 2011)

2.2   The Pacific context

Pacific regions consist of small economy countries with limited resources and prone to frequent natural disasters. This highlights the importance of accumulating the human capital. On the other hand, human capital quality closely related to not only education access and attainment but also the overall children well-being. Early childhood development is a key factor to ensure children develop to their full potential (Black et al, 2017)

Overall, in Pacific countries, majority of adult female has access to secondary education. On average, about 60% of adult women attained secondary education (World Development

Indicator). Compared with other developing countries in South Asia and Southeast Asia, this shows that access to education relatively better for women in Pacific regions. For instance, Tonga has 15 years mandatory education which longer than a typical developing country. Moreover, in most Pacific Island countries, the secondary net enrolment rate (NER) is significantly higher for girls than boys. One explanation for the gender disparity (in favour of girls) in secondary participation appears to be that boys leave school to pursue vocational training and employment opportunities, partially influenced by perceptions of traditional gender roles, limiting the number of females pursuing perceived "male" vocations and careers. In the meantime, there are still significant barriers to education, including the vast geographical dispersal of the islands, posing a serious challenge to access quality education. Poor internet connectivity and infrastructure also impede the development of online/remote training alternatives to address the geographical challenge. Several Pacific Island countries, such as Tonga and Tuvalu are among countries of our interest that rely heavily on financial and technical support from external donors to support their educational activities, raising concerns about the long-term viability of development initiatives (UNICEF, 2017). Extreme reliance on foreign donor funding makes the education system extremely vulnerable to external economic shocks, making it one of the most pressing sustainability challenges. Particularly in Kiribati, Tonga, and Tuvalu, funding for education development is inadequate, or is not reaching the areas that would benefit the most.

Despite relatively higher education attainment, the Pacific Island countries has specific challenges in terms of children and women well-being (Blankenship et al., 2020). First, compared to other developing countries in other regions, Pacific children has higher likelihood to suffer obesity, leading to higher likelihood of non-communicable disease (NCD) in later life. According to a recent analysis of Global Burden of Disease (GBD) study, NCD is the main causes of illness and death in the Pacific Island countries, accounting for more than three fourths of all deaths, with economic burden greater than expected for middle-income countries (Hou et al, 2022). The dramatic rise in the disease burden of obesity is largely due to shifting dietary patterns, including the change from a traditional diet of fish and fruits to one of highly processed food like biscuits, noodles, and high-fat products. A lack of arable land has also partly led to a decline in healthy agricultural production in the region. Moreover, cultural preferences and established norms for larger body sizes (which are seen as symbols of higher status, hierarchy, and beauty) may also contribute to the high rates of obesity in the

region (UNICEF, 2017).

Second, the regions also suffer from high gender-based violence evidence (World Bank, 2021). A recent analysis of survey data indicates that the lifetime prevalence of physical and sexual violence (by intimate partners and non-partners) among Pacific Island women ranges between 60 and 80 percent (UNICEF, 2017). Various child, adolescent, and maternal health outcomes were found to be affected by gender norms, frequently to the detriment of women and girls. Traditional gender roles, which are prevalent throughout the Pacific region, support and facilitate violence against women and girls. This type of violence has been linked to a several mental, physical, sexual, and reproductive health outcomes. Despite the fact that the status of women has been improving in the Pacific, women are still frequently viewed as subordinate to men, and gender roles remain quite rigid. According to the results of the Family Health and Safety Studies (2021), the widespread prevalence of physical and sexual partner violence can be traced back to entrenched gendered social norms that justify such treatment of women as a necessary and even deserved form of discipline for those who fail to adhere to traditional gender roles.

From cultural perspectives, a typical pacific nation household has large member size, co-habit with extended families, and often live within close proximity with relatives. On one side of coin, this could lead to potential informal child-care support that may or may not mask the importance of maternal knowledge. On the other side, living in larger family may also increase resource competition, especial for the young household member, as predicted in quantity-quality trade-off framework (Becker, 1981). Across the Pacific, kinship care is the most common alternative care for children. Yet, in many countries, there is still a lack of alternative care options for children who are unable to be placed in a safe environment with a family member. Inadequate access to alternative forms potentially endangers children, especially in situations where extended family networks are strained. Concerns are also raised about the care and protection of children in kinship care due to a lack of support and monitoring. (UNICEF, 2017). It has also been found that in some Pacific Island countries, children who live in larger families are at a higher risk of poverty. In Fiji, for instance, households with three or more children are more likely to be living in poverty (World Bank, 2017).

Our countries of study, except for Kiribati, share similar size of GDP per capita. However, children wellbeing indicators shows significant variations. Despite a potential link between the size of GDP per capita and children's nutritional status, for some countries, higher GDP per

capita does not necessarily mean better nutritional status for children. For instance, Kiribati, with the lowest GDP per capita, have the highest underweight and stunting prevalence of 6.9% and 15.2% of children less than 5 years. Nevertheless, Tonga's prevalence of underweight (0.8%) is significantly lower than Samoa (3.4%) and Tuvalu (2.9%), even though their GDP per person is about the same. Similarly, in terms of stunting, Kiribati has the highest share with 15.2% of children less than 5 years whose height-for-age is more than two standard deviations below the median of the reference population. This figure is followed by Samoa (7.3%), Tuvalu (5.7%), and Tonga (2.2%), where substantial variation is also observed among these three countries.

Along the same lines, public goods provisions and strategy related to early childhood development and maternal well-being also varies. The majority of the Pacific Island countries have formulated National Development Plans or Strategies, serving as a source of direction for the government, often covering a period of 3 to 10 years. Due in large part to the fact that many of the countries in the region are dependent on official development assistance (ODA), economic growth is a central component of many of the plans. However, social protection system that enables households to invest in children's wellbeing and human development is very limited and largely varies across countries. In Kiribati, although the provision is limited, there is social assistance measure focus on school fee schemes and provision of cash payments to incapacitates parents of secondary school children (UNICEF, 2017). Samoa has subsidised fee-free primary schools, but no cash transfer system for vulnerable children or families (UNICEF, 2017). Meanwhile, in Tuvalu and Tonga, currently there is no social assistance programmes targeting children or families who are poor and vulnerable (UNICEF, 2017). In most Pacific Island countries, other non-standard social protection schemes that are not provided by the state play a quite significant role. Important safety nets can be found in the form of informal extended family and community networks. Churches across the Pacific also provide forms of support to their members, but they also require time and financial commitment.

3 Data

3.1 MICS

This study uses the Multiple Indicator Clustering Survey (MICS) which is a multi-round cross-sectional harmonised household survey implemented by UNICEF that focuses on mother and

children's outcomes across low-income countries. The survey is designed to be representative of the adult population. Since the inaugural round in 1990, in addition to Vanuatu (surveyed in 2007-2008), the survey started to include broader Pacific countries in 2019-2020 which will be the countries of focus of this research.

In this study we use the sixth round of MICS conducted between 2019 and 2020 for Tonga, Kiribati, Samoa and Tuvalu. The survey interviewed women and men aged 15-49 years old and their household members. We find that the MICS suits our interest since the questionnaire has rich arrays of children's well-being outcomes including nutritional status, education and cognitive development. The MICS also provides detailed information on mother's characteristics and childcare practice within the households. For our main analysis, we restrict our sample to be children aged 0 to 14 years old who live in the same household as their mother. In some outcomes, such as the ECDI indicator, the sample was restricted to those aged older than 7 years old. In this survey, the respondent to the household questionnaire could be any knowledgeable adult member living in the household. The questionnaire for children under age five and children 5-17 is administered to the mother of the child.

The sampling frame of the MICS is designed to provide estimates that are representative at the national level and urban and rural areas.

3.2 Sample restrictions

Our main sample consist of children of aged 0-4 years old who cohabitate with at least with his/her mother. It yields a total of 6,714 of 6,718 total surveyed children where virtually almost every child identify their own mother as their main caregiver.[1]. Of 6,714 children, 182 children live in a household where father were not present during time of survey. The survey consist of a balanced composition of male and female children. About 52$ of 6,714 total children in main analysis were male, otherwise female.

3.3 Main variables

Nutritional status

Our first aspect of children's well being is nutritional status. First, we use the incidence of stunting as a measure of nutritional status. We follow WHO definition as we define stunted

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[1]About 99.94% of sample identifies mother as their main caregivers

Table 1: Descriptive statistics

	KIR	TON	TUV	WSM	Total
Child characteristics					
Total child sample	2179	1347	501.0	2687	6714
	(.)	(.)	(.)	(.)	(.)
Stunted (=1)	0.137	0.0141	0.0408	0.0429	0.0663
	(0.344)	(0.118)	(0.198)	(0.203)	(0.249)
Overweight (=1)	0.0170	0.130	0.0482	0.0742	0.0665
	(0.129)	(0.336)	(0.215)	(0.262)	(0.249)
ECDI - overall	0.774	0.734	0.658	0.670	0.717
	(0.152)	(0.181)	(0.156)	(0.228)	(0.197)
ECDI - learning	0.788	0.904	0.775	0.753	0.800
	(0.333)	(0.261)	(0.320)	(0.354)	(0.331)
ECDI - socioemotional	0.777	0.712	0.680	0.649	0.707
	(0.253)	(0.266)	(0.291)	(0.315)	(0.289)
ECDI - physical	0.843	0.691	0.763	0.748	0.767
	(0.236)	(0.301)	(0.266)	(0.318)	(0.292)
ECDI - cognitive	0.716	0.669	0.488	0.582	0.638
	(0.292)	(0.322)	(0.352)	(0.374)	(0.343)
Cronbach's alpha	0.462	0.558	0.323	0.673	0.555
	(.)	(.)	(.)	(.)	(.)
Mediating variable					
Mother care practice score	1.996	2.710	2.016	2.202	2.221
	(2.319)	(2.586)	(2.368)	(2.463)	(2.448)
Child attend ECE	0.320	0.162	0.326	0.121	0.210
	(0.467)	(0.369)	(0.469)	(0.326)	(0.407)
Mother's happiness score	0.535	0.672	0.741	0.663	0.627
	(0.499)	(0.470)	(0.439)	(0.473)	(0.484)
Mother experience DV	0.492	0.461	0.548	0.559	0.517
	(0.500)	(0.499)	(0.498)	(0.497)	(0.500)
Child physical punishment score	1.847	1.717	1.197	1.353	1.578
	(1.781)	(1.704)	(1.357)	(1.509)	(1.651)
Parents characteristics					
Mother's age	31.24	33.07	32.86	32.10	32.07
	(8.188)	(8.936)	(10.21)	(9.232)	(8.943)
Mother's year of schooling	10.25	11.40	12.14	12.46	11.50
	(2.567)	(2.357)	(2.905)	(2.271)	(2.616)
Father's age	23.91	23.16	22.47	26.91	24.86
	(15.98)	(17.80)	(17.06)	(17.27)	(17.04)
Father's year of schooling	6.947	7.045	7.232	8.297	7.527
	(5.011)	(5.711)	(6.167)	(5.914)	(5.646)
Father not live in HH (=1)	0.0255	0.0276	0.0388	0.0301	0.0287
	(0.158)	(0.164)	(0.193)	(0.171)	(0.167)
Live in urban area (=1)	0.528	0.211	0.650	0.162	0.326
	(0.499)	(0.408)	(0.478)	(0.368)	(0.469)
Index of household assets	0.713	0.979	0.994	0.885	0.855
	(0.453)	(0.142)	(0.0742)	(0.320)	(0.352)
Live with extended family (=1)	0.724	0.620	0.882	0.784	0.738
	(0.447)	(0.486)	(0.323)	(0.411)	(0.440)

children if his/her age-adjusted height (height-for-age) z-score lays below two standard deviations of his/her reference group.

Our second measure of nutritional status is overweight. Most studies that examine nutritional status and maternal well-being provide less attention to overweight incidence. Overweight is defined as age-adjusted body mass index (BMI) greater than two standard deviations of population. Consequently, very limited empirical evidence shed light on the relationship between maternal well-being and obesity. However, as widely known, Pacific countries have the highest rate of obesity for adults in the world. On one hand, childhood obesity is a predictor of adult obesity.

Childhood development

The MICS allows us to construct Early Childhood Development Index (Loizillon et al., 2017), a childhood development measure developed by the UNICEF. The measure consists of 10 parent-reported items that cover four domains of children development: learning, cognitive, social and emotional, and physical development. The questionnaire aims to track development progress of children aged 3 to 4 years old.

For each questions parents provide binary responds to the following questions. For learning domains, the survey ask whether: child able to (i) follow simple directions and (ii) do something independently. For cognitive domains, the survey ask whether a child able to: (iii) identify at least ten letters of alphabet, (iv) read at least four popular words, (v) knows name and recognizes all numbers from 1-10. For socioemotional domain, the survey ask whether a child able to: (vi) get along well with other children, (vii) kick, bites or hits other children or adults and (viii) get distracted easily. Finally, for the physical domain, the survey asks if a child is able to: (ix) pick up small objects with two fingers and (x) sometimes are too sick to play.

Although the set of questionnaires to proxy ECDI has been standardized and follow the UNICEF framework closely, it is possible that given the sample size, method of interview and other factors internal reliability of such questions might be affected. To test, we compute Cronbach's alpha to test internal reliability of 10 asked questions. The resulting Cronbach's alpha show that overall the measurement lies below the standard acceptable threshold of 0.60 (Taber, 2018)[2]. Respectively, the alpha coefficient ranged from 0.33 to 0.67 where Tuvalu is the

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[2]In practice many argue that the acceptable threshold ranged from 0.70 to 0.95 (Tavakol and Dennick, 2011)

lowest and Samoa is the highest. Despite the limitation, the index is the only reliable source of information regarding to early childhood development. In fact, the information used as an interim indicator for reporting on goal 4.2.1 of the Sustainable Development Goals (SDFs) in corresponding countries.

We construct ECDI scores by taking the mean average across 10 binary items. By construction, our ECDI takes value from 0 to 1, where higher scale represents higher development index. If a child satisfies all the development indicators, he/she takes the highest value of 1, while 0 otherwise. The measure also can be interpreted as how much a child achieves the bare minimum of childhood indicator according to their age. More on outcomes distribution are summarized in Appendix A2

Maternal education

The MICS provides detailed information on the highest level of education attended , highest grade attended including the highest grade completed. This allows us to measure an accurate measure of year of schooling rather than imputed year of schooling based on the highest level of education attended which is common in household surveys.

As mentioned in Section 2.2, the survey data also reflects high access to secondary education for mothers. From Table 1, it emerges that, on average, mothers of children sampled in main analysis complete 11 years of education. In other words, about 46% of children's mothers attended upper secondary education. It also reflected from the main analysed data their corresponding mother has slightly more educated their father. We present the illustrations of father and mother year of schooling distribution by country in Appendix A1

Given the unusually high level of education of women in the analysed sample, one may consider that a simple year of schooling measurement could not capture the variation of maternal education. On the other hand, measuring a simple year of schooling might not be able to capture the learning gain from the education itself. Thus, we consider the following alternative measures to maternal education. First, we consider the year of schooling gap to the completion of secondary grade. Second, we are also considering the difference between the actual year of schooling and the compulsory education level. As a note, the compulsory year of education varies across countries. Lastly, we construct a dummy variable that indicates if a mother has a higher year of schooling compared to the median of other mothers. We test the relationship of each proxy of maternal education to the children outcomes as part of our

results in Section 5

4 Estimation strategy

4.1 Baseline estimation

We adapt Cuartas (2022) approach to estimate linear correlation between year of schooling and children's well-being. The following equation summarises the linear specification to estimate the correlation between maternal education and child well-being for the pooled sample of four countries.

Where children's well being outcome Y of children i at household h who live in region r and country c. Our main maternal education variable is log of mother's year of schooling ($MotherYos$). We measure year of schooling as years of completed education rather than highest attended education grade. We include a vector of covariates (X) which include children age, mother's age, father's age, father's year of schooling, urban dummy, index of household assets (UNICEF, 2017), indicator variable of living with extended family and dummy variable of whether father of children does not live in the household at the time of survey.[3] Finally, we also control for country fixed effects (κ_c). We cluster our standard error at region level to correspond to each country.

$$Y_{i,h,r,c} = \alpha_0 + \alpha_1 MotherYoS + \alpha^k X + \kappa_c + \epsilon i, h, r \tag{1}$$

In the similar spirit of equation 1, we also estimate separately for each country to tease out the variation of maternal education effect. The estimation framework becomes the following.

$$Y_{i,h,r,c} = \alpha_0 + \alpha_1 MotherYoS + \alpha^k X + \epsilon i, h, r \tag{2}$$

As mentioned in the previous section, Pacific countries have relatively high education attainment as most women hold secondary degrees and a better attainment rate than men. Hence, the marginal effect of additional years of schooling might not be linear. As an alternative, we also use different measurements of maternal education. Our first alternative is years of compulsory education. This variable simply measures the gap between the actual

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[3]The dummy variable needed as for those who had no father cohabitation with children during the survey we recode their responses as zeros

completed year of education and the corresponding compulsory education year. As a second alternative measurement to education, we use years gap to complete secondary school. For instance, if a mother completed 8 years of schooling, the gap to completing secondary school is 4 years (assuming 12 years to complete full secondary school).

Although this paper does not claim causality, to the reader's benefit, it is important to discuss the endogeneity issues of examining the effect of maternal education on children 's well-being. The endogeneity between the two could be established in several ways. First, highly educated mothers may inherit a particular individual trait or ability in their children. Hence, the quality of education does not matter much to the children's well being when measured in cognitive outcomes. Second, there are many confounding factors that affect mother education and children's well -being at the same time. Third, maternal education decision

As part of our sensitivity check, we employ an instrumental variable approach to deal with this endogeneity issue. We use peer's mother education as an instrument to the mother year of schooling. The two-step procedure is summarised as follows.

$$MotherYoS = \beta_0 + \beta_1 PeerMotherYoS + \beta^k X + \kappa_c + \epsilon i, h, r \tag{3}$$

$$Y_{i,h,r,c} = \delta_0 + \delta_1 Moth\hat{e}rYoS + \delta^k X + \kappa_c + \epsilon i, h, r \tag{4}$$

Peer is defined as group of people that share a birth cohort, region of residence, religion, ethnicity group and country of residence. The rationale of the validity of the instrument as follows. We argue that that peer's education satisfies the relevance condition for the following reasons. First, peer's education may affect children's mother education via social networks. Literature has shown the same gender-peer effect on female education and employment. Peer's education also captures education policies applied to particular birth cohorts, if any. Second, we assume that a mother's peer's education is less likely to directly affect own children's well-being. Peer's education might affect one's own children's education only via their own mother's education or if one believes there is such spillover effect from the community. We construct mother's peer education as a leave-one-out means of education such that one's own mother's education does not contaminate peer's education.
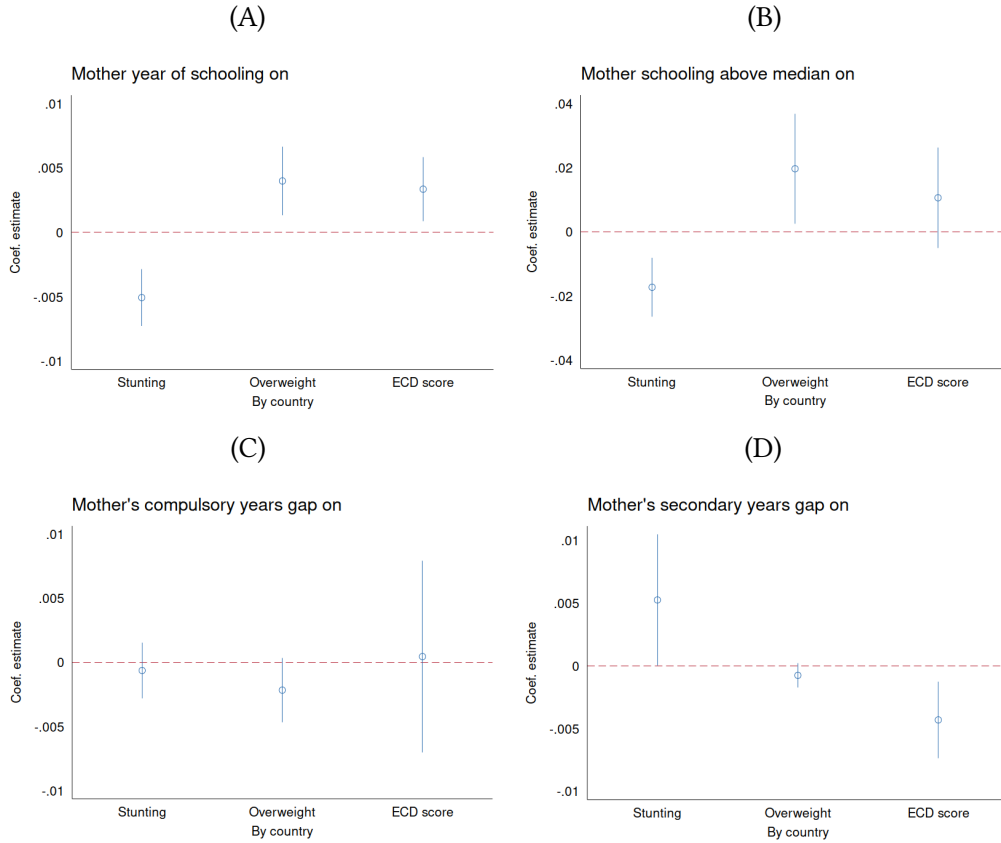
5 Results

5.1 Regression analysis

We start with Figure 1 which summarises the effect of maternal education, proxied by several alternatives, to the children's well-being. This plot refers to equation 1. Each plot in Figure 1 represents separate regression on pooled samples of countries. From Panel A and B, it emerges that using year of schooling and the dummy variable of having year of schooling higher than median, maternal education has negative effect on stunting incidence and positive effect on overweight likelihood. However, the two measurements disagree on the effect on ECDI score. Year of schooling model captures positive effect on ECDI meanwhile having longer years of schooling than half of mother observations have positive but not statistically significant correlation. From Panel C and D, we learn that there is no effect of maternal education on any of child well-being indicators. To the purpose of this study, we argue that using year of schooling instead of dummy variable of had year of education above median as a better proxy of maternal education captures more variation along the incremental increase of level of education.[4] Thus, we focus on the year of schooling variable for the rest of the discussion. Full results can be found in Appendix B1

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[4]Comparison between mother who had below and above median of year of schooling over child well-being outcomes are summarized in Appendix A3 and Appendix A4.

Figure 1: Mother education proxies and children well-being

(A)

Mother year of schooling on

(B)

Mother schooling above median on

(C)

Mother's compulsory years gap on

(D)

Mother's secondary years gap on

Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Co-variates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

Next, we consider our model separately for each country and outcomes. Coefficient of estimates plotted in Figure 2 correspond to equation 2. Mixed results emerge across countries. First, as in Panel A, we find that in Kiribati and Samoa, additional years of education correspond to lower stunted children's likelihood. The coefficient, albeit small, is substantive considering the incidence of stunting in corresponding countries. An additional year of schooling corresponds to 5.4% ($\frac{0.07}{0.13}$) and 6% ($\frac{0.004}{0.6}$)reduction of stunting incidence.

On overweight incidence (see Figure 2, Panel B), we find that positive correlation between maternal education and children overweight is also driven by Kiribati and Samoa results. We find empirical evidence that suggests higher maternal education correlates with a high inci-dence of overweight. This supports previous findings (Feng et al., 2019; Makoka and Masibo, 2015; Fertig et al., 2009) that show positive correlation between maternal education and obe-sity. In regard to previous studies, one possible explanation is that mother education affects

obesity via employment effects. A highly educated mother is likely to be more participating in the labor market. Thus, this could affect feeding behavior, such as more take-aways food intakes due to limited time available for feeding preparations. It also possible that children from highly educated mother will be less likely to be involved in child labor as family worker. Mother with high education would likely be participating in formal occupation. Whereas, children from low educated mothers may be more likely to be involved as family workers which affect their physical activities intensity.

Lastly, we find that positive correlation between mother education and ECDI score is driven by Samoan sample (see Figure 2, Panel C). In most countries, maternal education has null correlation to ECDI score, except for Samoa. This could relate with our early concern of low scale reliability coefficient of ECD questionnaire in Kiribati, Tuvalu and Tonga. Notice that only in Samoa we find Cronbach alpha to be at an acceptable level. Despite potential measurement error, we take this as weak evidence of positive correlation between maternal education and ECDI score. Further investigation on ECDI score reveals that maternal education only affect physical dimensions (see Figure 3).

Figure 2: Mother education and children well-being, by countries
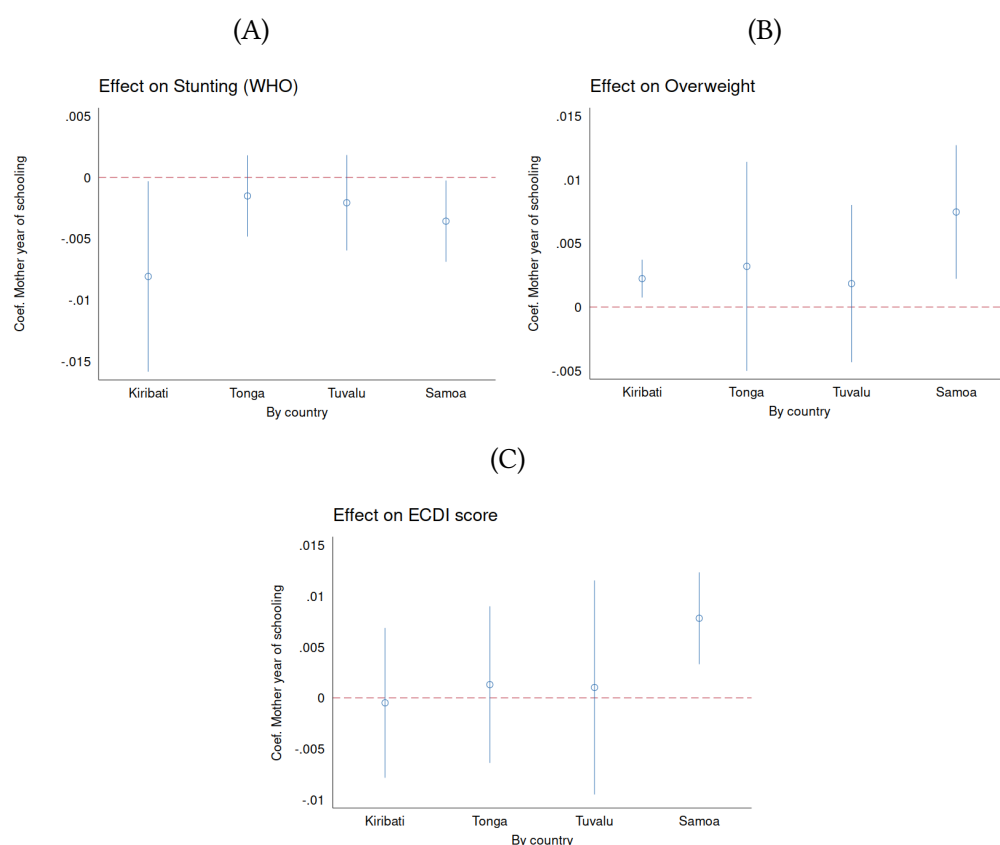
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

Figure 3: Mother education and component of ECDI
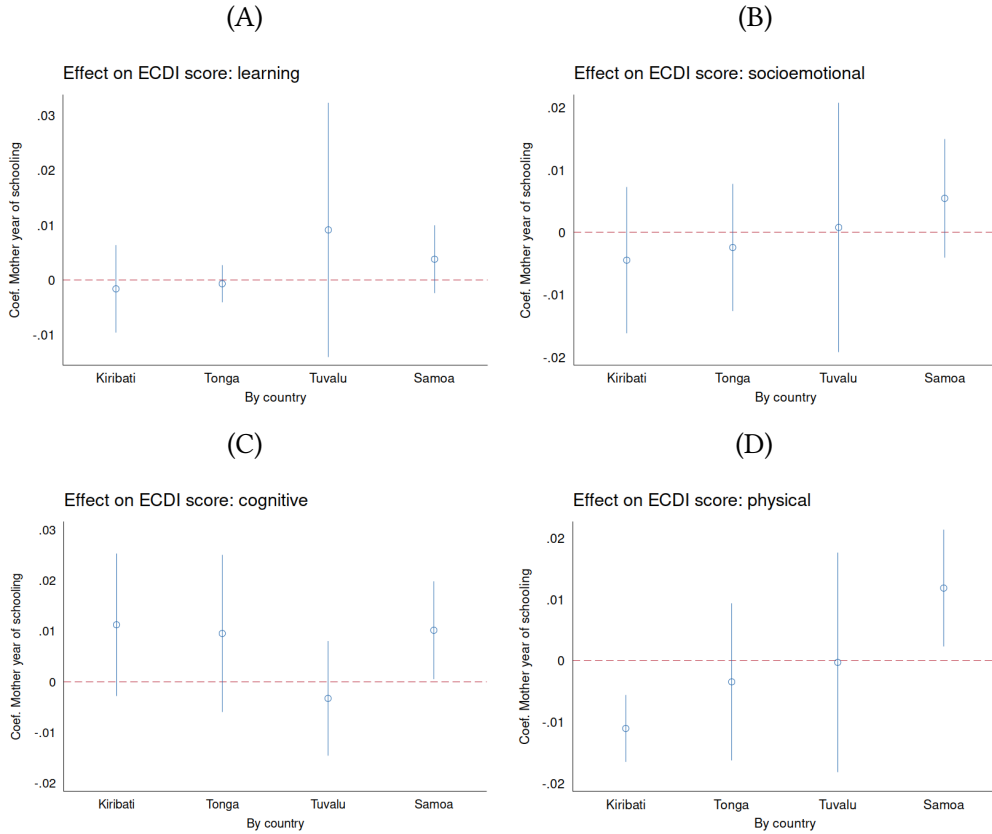
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Co-variates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

5.2 Mediating variable

Previously we find suggestive evidence that show positive association between maternal education on overweight incidence and ECDI score, albeit weak as well as negative correlation to stunting incidence. In this section, we examine further factors that significantly affect children's well-being outcomes. In other words, we look into several mediating factors that correlate to children's well-being. Figure A5 summarizes the idea of such mediating effects and direct effects of year of schooling to the children well-being.

We focus on five potential mediating variables of maternal education to children well-being Cuartas and McCoy (2021). The first mediating variable is the mother's care score. Mother care score constructed using a set of unique questionnaires that elicits several caring practices. We first use information that determines whether any household member aged

15 years old engages in the following activities to the corresponding child: reading books, telling stories, singing songs, taking outside, playing with names, drawing, counting things. We simply construct a score based on the number of care practices performed by the mother. We then combine this score with vaccination status and public health utilisation to create a composite score of mother's care practice.

Our second mediating variable is whether parents enrol their children to ECE. As summarised by (Cuartas and McCoy, 2021), early childhood education has empirically proven to have a long-lasting impact on children 's cognitive development.

The third mediating variable is the scale of mother happiness where higher scale represents more happiness level. Amato (1994) find that mother's well-being, including psychological well-being, is an important factor that affects children's well-being. In fact, mother well-being affects the relationship between mother and children.

As our fourth and last mediating variable, we look into abusive behaviors within the household. First, we construct a dummy variable that indicates if the mother was a victim of domestic violence. Lastly, we construct a score that indicates the number of physical punishment methods used to discipline children in the household. The survey lists twelve methods of disciplining a child where six of them were direct physical contact, which includes (i) shook him/her, (ii) spanking on the bottom with bare hand, (iii) hit on the bottom with hard object(s), (iv) slapped on the face, (v) hit or slap on the hand arm and leg and (vi) beating as hard as one could.[5] The score is a linear additive of each binary response from the adult respondents.

We begin with establishing the correlation between mother year of schooling and the mediating variables. We estimate each of the mediating variables on the mother year of schooling using the same covariates as in equation 2. Figure 4 summarises the results.

We find evidence that suggests the mother year of schooling has a positive association with higher care score, enrolling children to ECE and happiness. On the opposite side, mother year of schooling has a negative correlation with the mother being a domestic violence victim and practicing physical punishment to children.

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[5]The rest of discipline methods includes: took away privileges or not allowing children to leave the house, gave something else to do, shout or yelled at, explain what was wrong and lock or tie the child (only available in Kiribati.

Figure 4: Mediating variable and maternal education
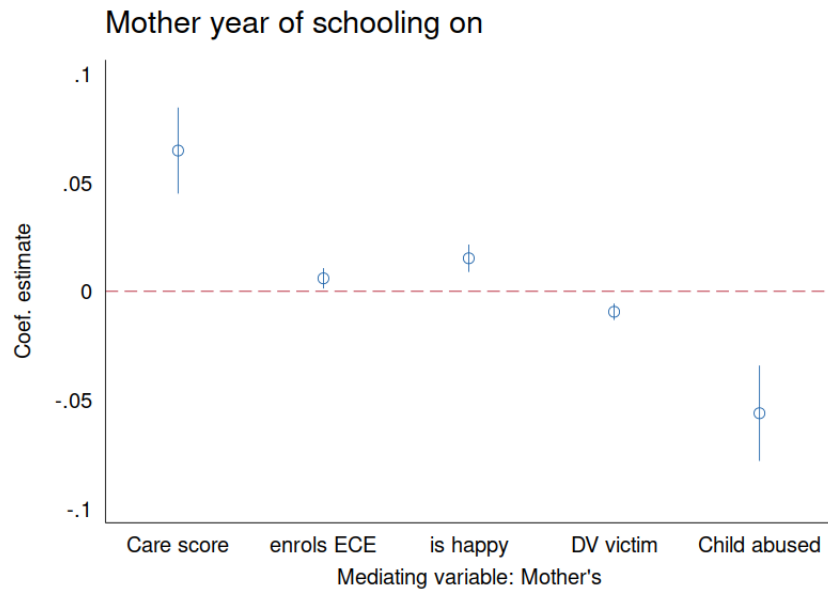
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

Next, we test if there exists a correlation between the mediating variable and children's well-being. In similar spirit with equation 2, but now we estimate children outcomes with each of the mediating variables. The results are summarised in Figure 5.

From Figure 5, Panel A, we find evidence that enrolling children in ECE positively correlates with ECDI score but not for other outcomes. From Panel B, we find that mother care score has negatively correlated with stunting and positively with ECDI score. We find no evidence of mother happiness correlating with the children's well being however, mother happiness seems to correlate with less overweight children. We also do not find convincing evidence on the correlation between mothers who were victims of domestic violence and children's well-being (see Panel D). Surprisingly, we find that physical punishment practice has positive correlation with ECDI. Further investigation shows that this results driven by positive correlation between physical punishment and physical dimension of ECD. We present the corresponding table to Figure 5 in Appendix B2

Figure 5: Mediating variable and children well-being
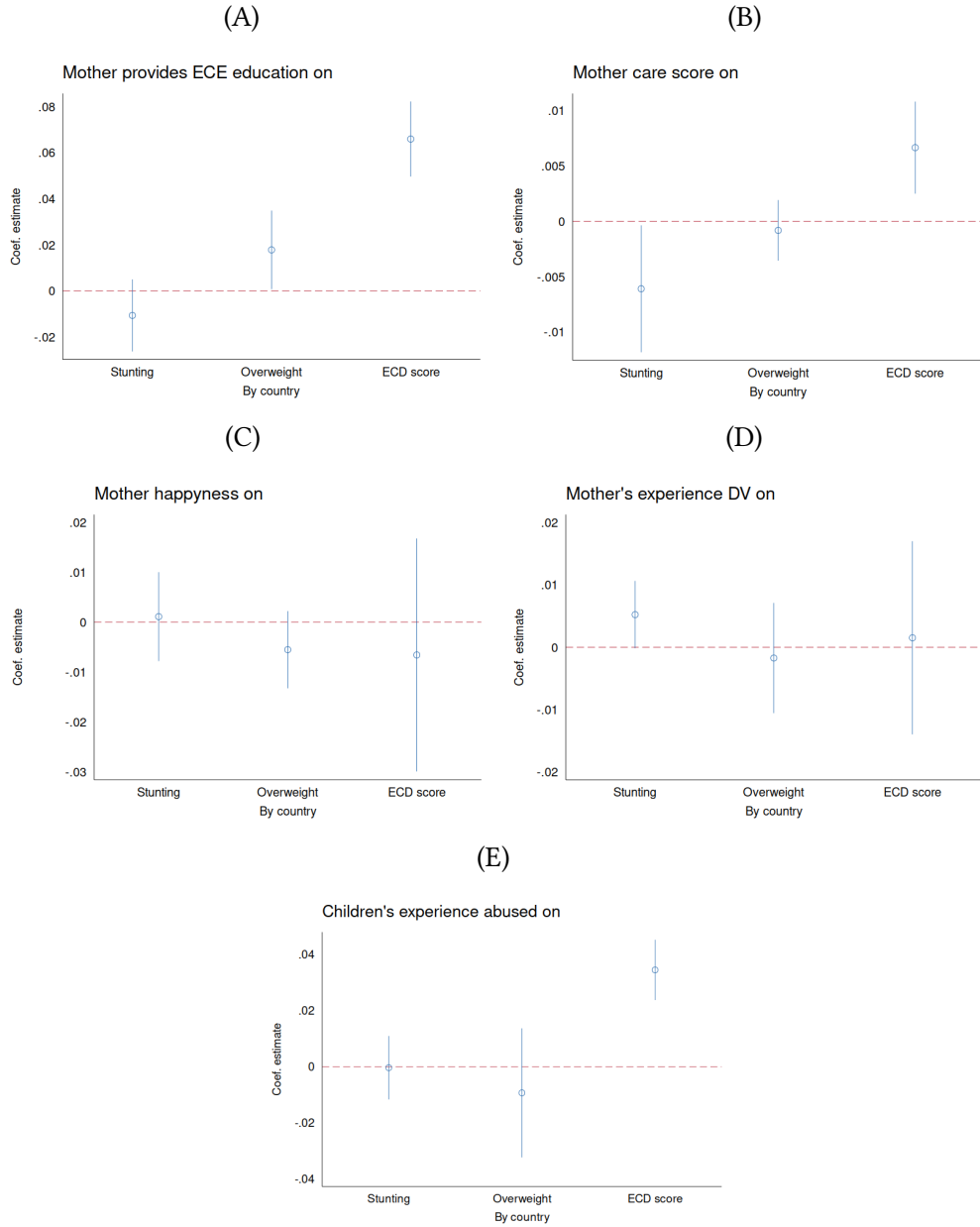
Notes: Results are based on MICS dataset

Finally, we want to test whether after controlling for mediating variables, it would absorb all the year of schooling effect. In practice, we estimate the following.

$$Y_{i,h,r,c} = \gamma_0 + \gamma_1 MotherYoS + \theta Mediating + \gamma^k X + \kappa_c + \epsilon i, h, r \qquad (5)$$

If year of schooling affect children's well being via all the mediator variables, we expect $\gamma_1 = 0$. The case when $\gamma_1 \neq 0$ could be interpreted in two ways. Firstly, it presents evidence of direct effects of year of schooling on children's well being. Secondly, the non-null effect of

year of schooling after controlling of mediating variables may serve as evidence to omitted mediating variables.

From Figure 6, we learn that $\gamma_1 < 0, \gamma_1 > 0$, and $\gamma_1 = 0$ for likelihood of stunting, overweight and ECD score respectively. For ECD score, the mediator variable seems to capture all the effects from year of schooling and leave the direct effect of year of schooling to be null. On the other hand, for stunting and overweight children outcomes, we find evidence that there is a direct effect of years of schooling or other important mediating factors that are omitted in the model. In the next section, we consider which possible explanation is empirically evident by estimating a 'causal model' of year schooling to check the existence of direct effects of year of schooling. We present the corresponding table to Figure 6 in Appendix B3

Figure 6: Mediating variable and maternal education
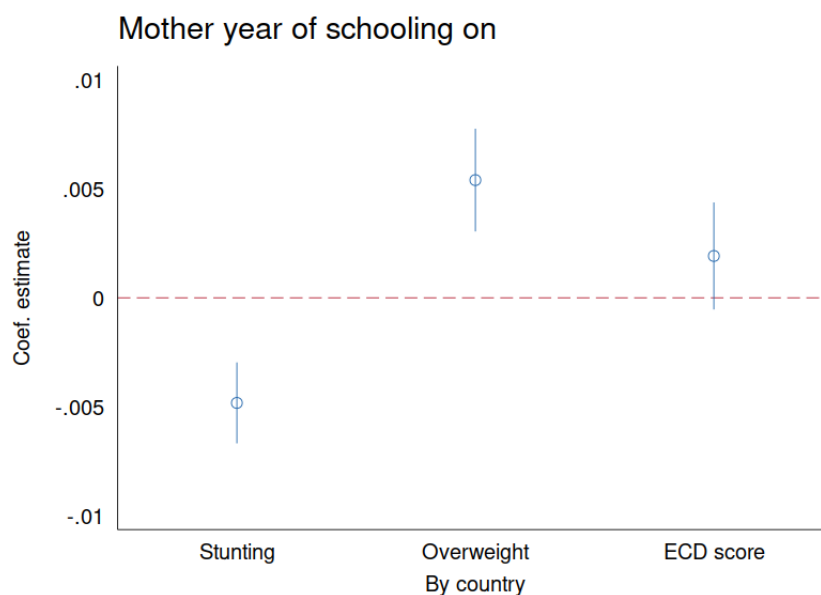
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and an indicator of a father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

5.3   Test for 'causal effect' - IV approach

In this section, we test for a direct effect of years of schooling using the instrumental variable approach. As mentioned in section 4, we employ leave-one-out mother's peer education as an instrument to mother education. We argue that peer education potentially affects mother's

education via confounding education policy exposure to particular birth cohorts and social conformity. We also argue that peer's years of schooling are unlikely to affect children's well-being directly.

To begin with, the first stage results show a strong and positive correlation between a mother's peer's years of schooling and the mother's year of schooling. The coefficient of correlation is 0.2 ($t - 6.10$), with (Kleibergen-Paap rk LM statistic is 36.159. Full report on the 2SLS regression available in Table 2.

Figure 7 summarises our main estimate of interest from the second-stage regression. It suggests that year of schooling only has causal effect on stunting outcomes but not other outcomes. Using these results, we argue that for overweight and ECD outcomes, year of schooling has zero direct effects but we potentially exclude important mediating factors. However, for the stunting outcome we observe that such direct effects from year of schooling exist.

Figure 7: Second-stage results: Direct effect of year of schooling on outcomes
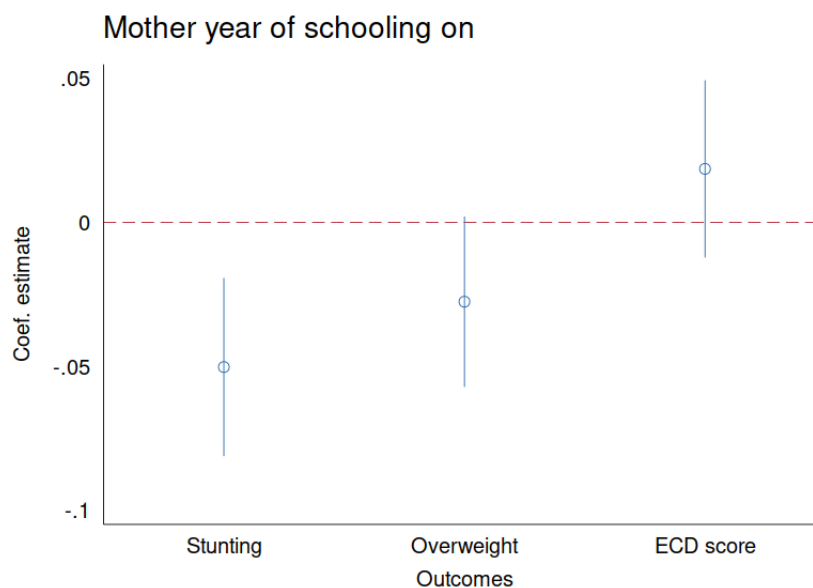
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Instrument variable is leave-one-out mean of year of schoolinf of mother's peers. Peer group defined based on birth cohort, region of residence and religion. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level. Plotted standard errors reflect a 95% confidence interval.

Table 2: IV regression

	(1) Stunted (=1) b/se	(2) Overweight (=1) b/se	(3) ECDI - overall b/se
Mother YOS	-0.050***	-0.028	0.019
	(0.019)	(0.018)	(0.019)
Kleibergen-Paap F-stat	35.896	34.854	18.099
Kleibergen-Paap rk LM-stat	36.159	35.149	17.878
R2	-0.129	-0.046	0.062
Mean	0	0	1
Covariates	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	robust	robust	robust
First-stage			
	Mother YOS b/se/t	Mother YOS b/se/t	Mother YOS b/se/t
Peer year school	0.211***	0.208***	0.252***
	(0.035)	(0.035)	(0.059)
	[5.991]	[5.904]	[4.254]
Observations	6384	6346	2631

* $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard errors in round parentheses. t-statistics in brackets. Results are based on the MICS dataset. Instrument variable is peer's mother's year of schooling. Peer groups are defined as sharing same 5-year birth cohort group, gender, regions of residence and country of residence. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level.

Figure 8: Mother education and children well-being

(A)   (B)

(C)
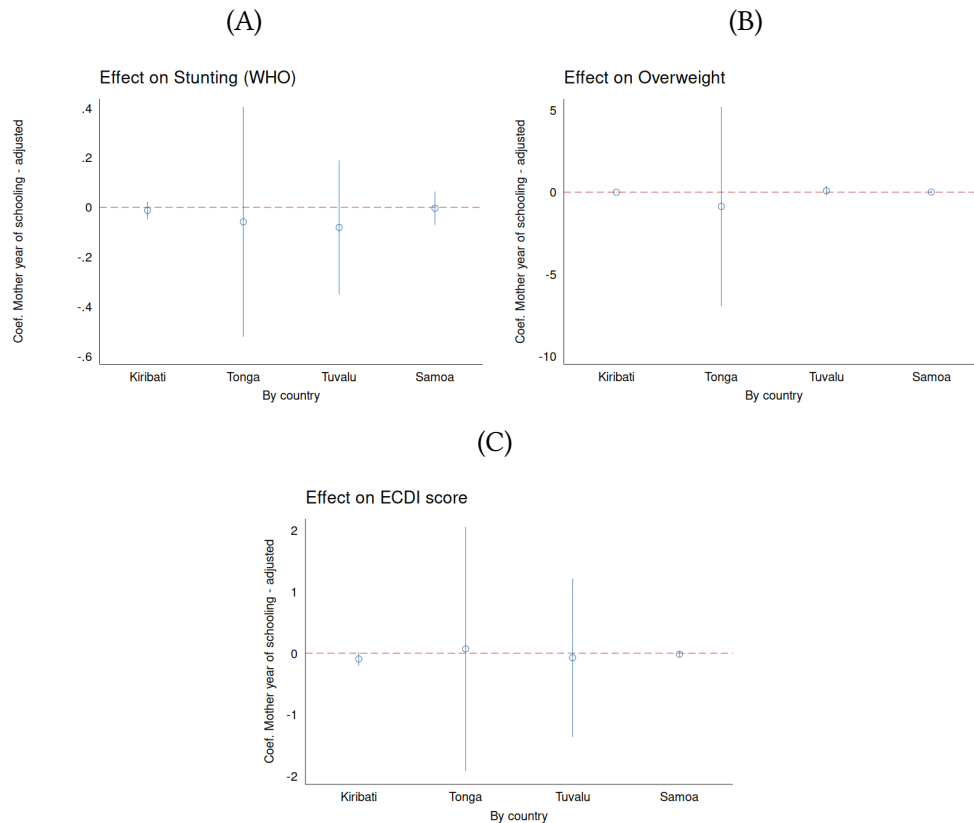
Notes: Results are based on MICS dataset

6　Conclusion

We study the relationship between maternal education and child well-being using Pacific countries as a study case. Pacific countries provide unique motivation to the literature for at least four reasons. First, empirical studies on Pacific countries have been very limited due to data availability issues. Second, women in Pacific countries relatively enjoy good access to education where most women at least have a secondary degree. Third, children in Pacific countries are exposed to high obesity cases compared to other developing countries.

Using the richness of MICS dataset, we investigate the role of year of schooling on child well-being as measured by three outcomes: stunting incidence, overweight incidence and ECDI score. Overall, we find that year of schooling has negative correlation to stunting incidence. On the contrary, it has a positive correlation to ECD score and being overweight. Further analysis shows the effect varies across countries.

We examine further potential mechanisms behind the role of year of schooling on child well-being outcomes. We find that providing ECE education and better care practice as two important mediating factors that explain indirect effects of years of schooling. We further find suggestive evidence that year of schooling has positive direct effects to stunting, arguably via nutritional knowledge which is not fully captured by the mediating factors.

Finally, from policy perspectives improving access to education to the women population per se has limited effect in Pacific countries. Our results advocate for disseminating specific maternal and parenting knowledge and improving ECE access to more children as more effective policies to improve child well-being in the area.

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7 Appendix

Figure A1: Density estimate of year of schooling
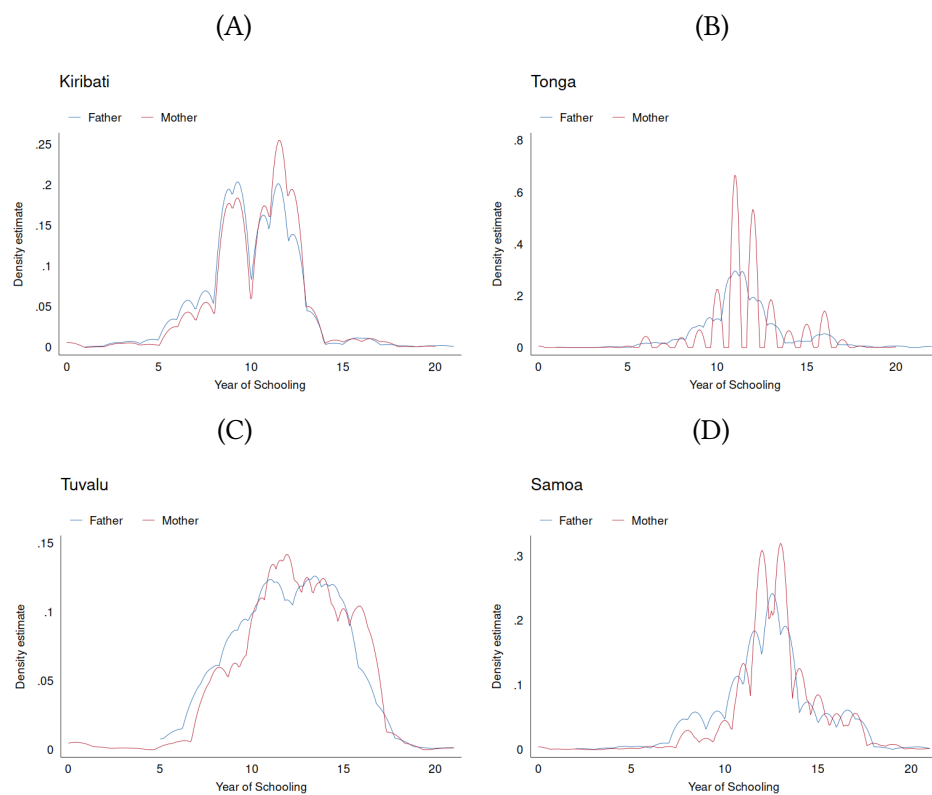
(A)

(B)

(C)

(D)

Notes: Estimates using Epanechnikov kernel. Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Mother and father year of schooling considers level of educaiton attended and actual years completed.

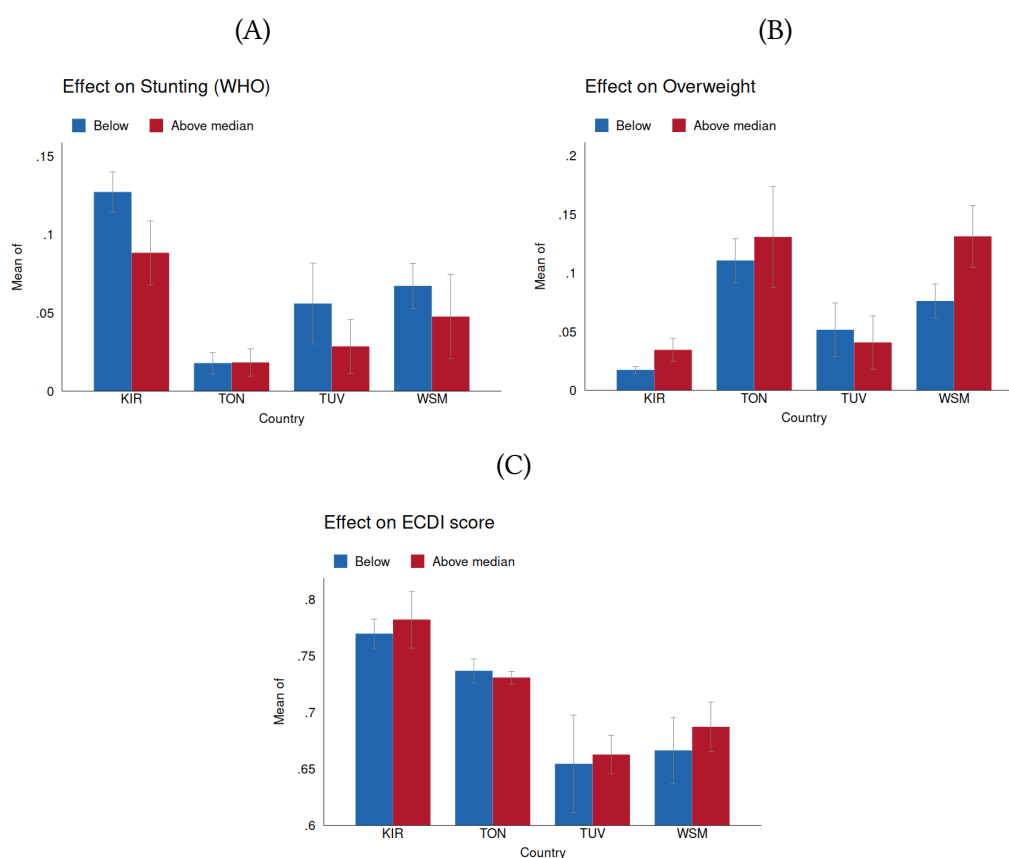Figure A2: Density estimate by outcomes and country
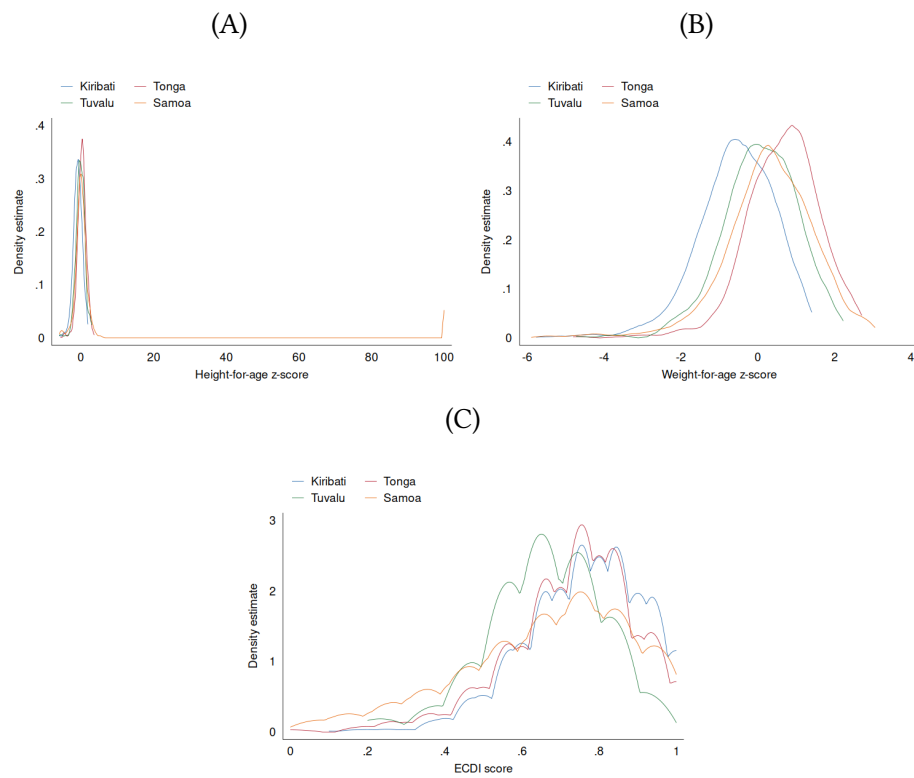
(A)

(B)

(C)

Notes: Estimates using Epanechnikov kernel. Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother.

Figure A3: Mother education and child well-being

(A)

Effect on Stunting (WHO)

(B)

Effect on Overweight

(C)

Effect on ECDI score

Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Standard error clustered at region level. Plotted standard errors reflect a 90% confidence interval.

Figure A4: Mother education and component of ECDI
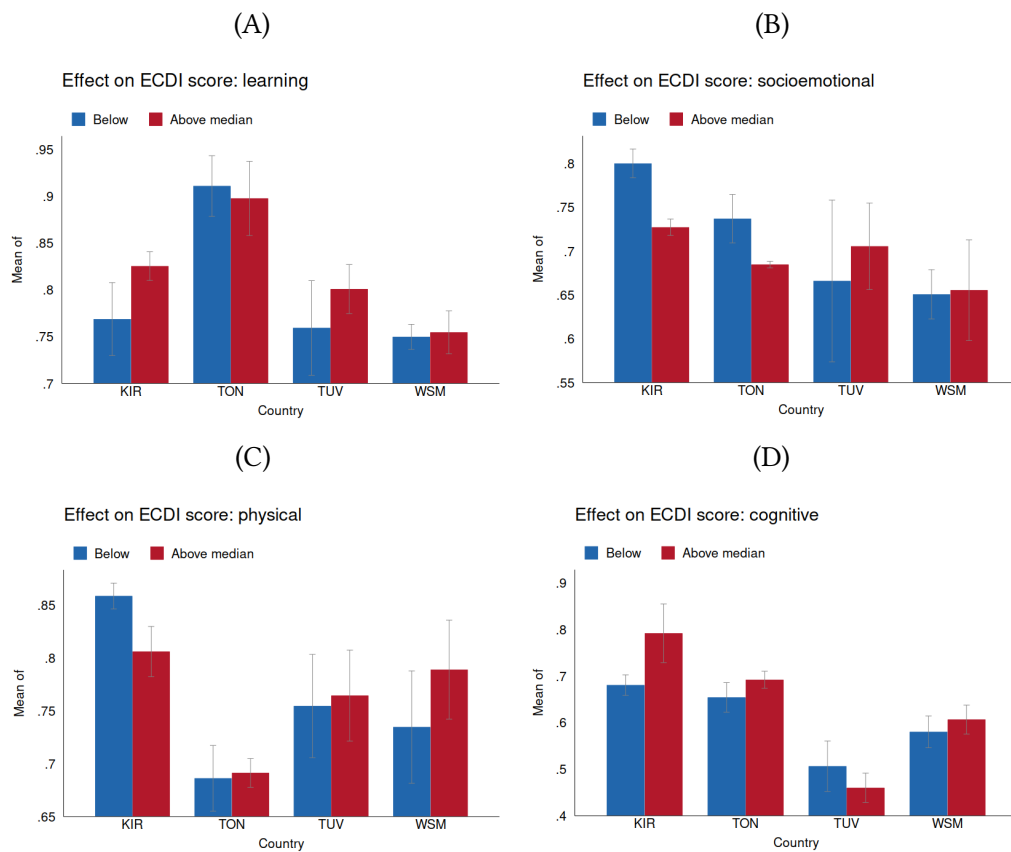
Notes: Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Standard error clustered at region level. Plotted standard errors reflect a 90% confidence interval.
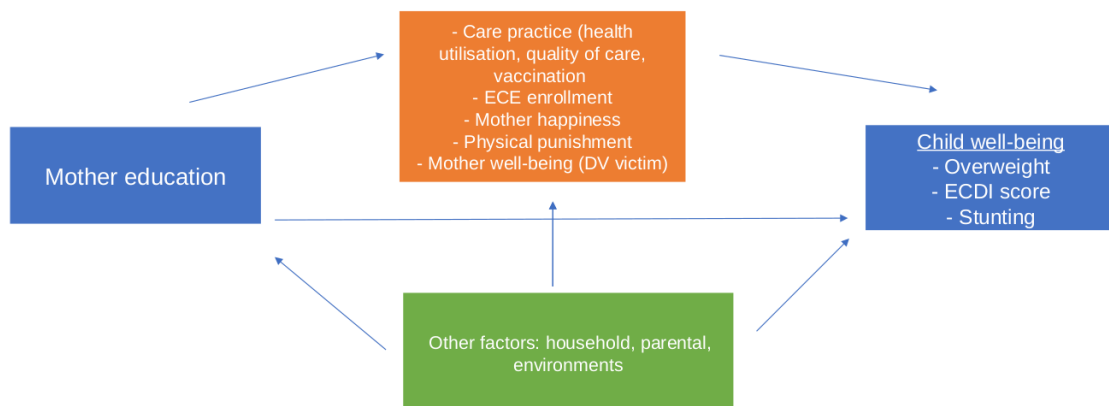
Figure A5: Mediation illustration

Table B1: Baseline regression

	(1) Stunted (=1) b/se	(2) Overweight (=1) b/se	(3) ECDI - overall b/se
Mother YOS	-0.005***	0.004**	0.003**
	(0.001)	(0.001)	(0.001)
Mother's age	0.000	0.001	0.000
	(0.000)	(0.001)	(0.000)
Age of children	0.005	-0.006***	0.072***
	(0.003)	(0.001)	(0.009)
Father's age	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Father's year of schooling	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)
Father not live in HH (=1)	0.027	0.046	0.014
	(0.024)	(0.024)	(0.008)
Live in urban area (=1)	0.002	0.025**	0.002
	(0.007)	(0.010)	(0.008)
Index of household assets	-0.016	0.012	0.030**
	(0.017)	(0.009)	(0.011)
Live with extended family (=1)	-0.011	-0.000	-0.005
	(0.007)	(0.007)	(0.011)
TON	-0.086***	0.088***	-0.049***
	(0.011)	(0.014)	(0.007)
TUV	-0.058**	0.004	-0.120***
	(0.016)	(0.016)	(0.008)
WSM	-0.038***	0.064***	-0.111***
	(0.009)	(0.009)	(0.012)
Constant	0.170***	-0.062**	0.445***
	(0.023)	(0.019)	(0.013)
R2	0.024	0.029	0.094
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions

* $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard errors in round parentheses. Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level.

Table B2: Mediating variable regression

	(1)	(2)	(3)
	Stunting (=1)	Overweight (=1)	ECDI score
	b/se	b/se	b/se
Mother care score	-0.006*	-0.001	0.007**
	(0.003)	(0.001)	(0.002)
R2	0.024	0.028	0.098
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions
	b/se	b/se	b/se
Mother happiness	0.001	-0.005	-0.007
	(0.005)	(0.004)	(0.012)
R2	0.021	0.027	0.096
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions
	b/se	b/se	b/se
Mother's experience DV	0.005	-0.002	0.002
	(0.003)	(0.005)	(0.008)
R2	0.021	0.027	0.095
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions
	b/se	b/se	b/se
Children's experience abused	-0.000	-0.004*	0.009***
	(0.002)	(0.002)	(0.002)
R2	0.022	0.029	0.098
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions
	b/se	b/se	b/se
Mother provides ECE education	-0.011	0.018*	0.066***
	(0.008)	(0.009)	(0.008)
R2	0.023	0.029	0.113
Mean	0.072	0.071	0.715
Country FE	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered S.E	Regions	Regions	Regions

* $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard errors in round parentheses. Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level.

Table B3: Mediating variable regression

	(1) Overweight b/se	(2) Stunting (WHO) b/se	(3) ECDI score b/se	(4) ECDI - learning b/se	(5) ECDI - socioemotional b/se	(6) ECDI - physical b/se	(7) ECDI - cognitive b/se
Mother year of schooling	0.005***	-0.005***	0.002	0.000	0.001	0.001	0.005
	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)	(0.001)	(0.005)
Mother provides high care	0.003	-0.016	0.033**	0.037*	0.003	0.022**	0.068**
	(0.005)	(0.009)	(0.009)	(0.015)	(0.005)	(0.008)	(0.020)
Mother provides ECE education	0.013	-0.012	0.063***	0.052***	0.019	0.024	0.140***
	(0.010)	(0.008)	(0.012)	(0.014)	(0.012)	(0.016)	(0.022)
Mother happiness	-0.008	0.004	-0.007	-0.009	-0.009	-0.020	0.006
	(0.004)	(0.004)	(0.011)	(0.023)	(0.021)	(0.019)	(0.020)
Mother's experience DV	-0.004	0.002	-0.002	0.001	-0.007	0.020	-0.014
	(0.005)	(0.003)	(0.007)	(0.013)	(0.012)	(0.011)	(0.014)
Children's experience abused	-0.004	-0.001	0.011***	0.007	0.033***	0.008**	-0.007***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.002)
R2	0.030	0.024	0.127	0.055	0.079	0.055	0.138
Mean	0.071	0.072	0.715	0.797	0.705	0.762	0.637
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All children	All children	All children	All children	All children	All children	All children
Clustered S.E	Regions	Regions	Regions	Regions	Regions	Regions	Regions

* p<0.05, ** p<0.01, *** p<0.001. Standard errors in round parentheses. Results are based on the MICS dataset. Sample of 6,174 children who cohabitate with their mother. Covariates include children's age, mother's age, father's age, father's year of schooling, living in urban dummy variables, living with extended family, household asset index and indicator whether father lives in the household during the interview. Standard error clustered at region level.