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Maternal education and children's well-being: Evidence from four Pacific countries

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ADB Working Paper Series

**MATERNAL EDUCATION
AND CHILDREN'S WELL-BEING:
EVIDENCE FROM FOUR PACIFIC
COUNTRIES**

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Dyah Pritadrajati

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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 the Multiple Indicator Clustering Survey (MICS) dataset to investigate this relationship and its underlying mechanisms. We find that the number of years of schooling attained by mothers is positively correlated with the likelihood of children being overweight and the Early Childhood Development Index (ECDI) score, while it is negatively associated with child stunting. These patterns are mainly driven by the Kiribati and Samoa country samples, potentially due to larger sample sizes. Further investigation reveals that the number of years of schooling attained by mothers indirectly affects these outcomes through better caring practices and the higher likelihood of enrollment in early childhood education (ECE). Meanwhile, the lower likelihood of stunting appears to be a direct effect of greater maternal education. Our findings suggest that improving access to, but not the quality of, education for women may provide limited future returns for children's well-being, and they highlight the importance of disseminating specific maternal and parenting knowledge and improving ECE access.

Keywords: maternal education, stunting, obesity, early childhood development, Pacific countries

JEL Classification: I25, J1, J13, F63

1 Introduction

Our study investigates the correlation between maternal education and children's well-being in four countries in the Pacific: Tonga, Kiribati, Samoa, and Tuvalu. We focus on small-island economies in the Pacific given their unique economic, geographic, and sociocultural challenges and opportunities. Their vulnerability to frequent natural disasters highlights the importance of prioritizing human capital investment over physical capital. This study looks into both the health and educational well-being of children, and it explores potential mediating factors as a way to understand the potential mechanisms that influence children's well-being. The latter aim is carried out by testing the hypothesis that a well-educated mother is positively associated with better childcare practices, as well as the mother's well-being, which will then influence the children's well-being.

Domestic violence and the vulnerability of informal employment are two major women-specific challenges in the region. Pacific countries rank among the worst in terms of incidences of violence against women, including domestic violence. As many as 60% of women and girls have experienced violence from intimate partners or family members. Large informal and subsistence economies characterize the labor market across the Pacific, with a significant share of the workforce (about 25%) working in vulnerable employment situations. A vast number of women are engaged in subsistence agriculture with minimum income security and social protection. The nutrition and education status of Pacific children is relatively low compared to other developing countries. Many households were already struggling to provide enough nutritious food to their children before the COVID epidemic hit due to conflict, natural disasters, and climate change, with one in every three children under five suffering from malnutrition. According to a recent report by Save the Children (Richards et al. 2020), the prevalence of children suffering from stunting in the Pacific is 38.4%, which is higher than that in Asia (31.7%) and Eastern Africa (34.5%), and Middle Africa (31.5%). Countries in the Pacific have also experienced limited progress in universal primary education and even a decline in net enrollment rates (Kiribati).

Among the many ways to promote gender equality and female empowerment, the importance of education cannot be overstated. This study contributes to the lack of literature and empirical findings on maternal education, economic opportunity, and children's well-being, particularly in the Pacific. This paper aims to provide evidence of how investing in women's education can enhance the well-being of children. Investing in women has a profound impact not only on their families but also on communities and countries; by leading healthier and more productive lives, women can build better futures for themselves and their families. In a region where access to education is relatively high in terms of enrollment, it may be useful to learn how extending education at the margins can improve children's well-being. If positive results are found, then investment in access to education must continue, but if limited effects are found, then other factors or mechanisms that influence children's well-being, including

educational quality, must be investigated.

Existing studies suggest a positive relationship between women's empowerment and economic development in either direction (Duflo 2012). Investing in women improves the well-being of families. Improving women's education leads to higher-quality childcare (the nurture effect), which leads to improved child welfare and health in both the short run and long run (Chen and Li, 2009). At the household level, improved educational attainment for women increases labor market access for women, which also leads to additional resources being allocated for children within a household. Improving education could also lead to greater bargaining power within households for women, which also affects the allocation of household resources to children (Doss 2013). Finally, a growing number of studies highlight the direct importance of maternal education for children's well-being (Andrabi, Das, and Khwaja 2012; Black, Devereux, and Salvanes 2005; Cuartas 2022)

Motivated by the aforementioned context, we aim to answer two main research questions: (1) Does a mother's education have a positive association with the improvement of a child's well-being? (2) What is the mechanism behind the improvement of children's well-being, if any? If there is not such a relationship, what could be the factors that hinder such mediation relationships? As our study is non-causal, we focus on looking at the mechanism that causes improvement in education to improve children's well-being. First, as the baseline estimation, we provide the results of the linear correlation between the years of schooling attained by mothers and children's well-being. Next, we explore potential mediating variables of maternal education based on the evidence provided by the baseline estimation. We focus on five potential mediating variables (Cuartas 2022), including (1) the mother's care score, (2) children's enrollment in early childhood education (ECE), (3) the mother's happiness indicator, (4) female domestic violence, and (5) the physical punishment of children.

This paper contributes to the literature on the Pacific in three ways. First, our paper, to the best of our knowledge, is the first systematic effort to provide evidence of the effect of maternal education on children's well-being in the Pacific by offering multiple alternative measurements of maternal education and children's well-being. Second, we complement previous studies by using a mediation framework to examine mother-children relationships and the mechanism behind the improvement of children's well-being using rich household survey data. Third, our paper provides unique cross-country insights using datasets from multiple countries. Lastly, our paper also contributes to the literature by providing empirical evidence of the relationship between maternal education and children's well-being when access to education for women is already high.

Using the richness of the Multiple Indicator Clustering Survey (MICS) datasets, we investigate the role of the years of schooling attained by mothers on children's well-being, as measured by three outcomes: the stunting incidence, overweight incidence, and Early Childhood Development Index (ECDI) score. Overall, using the pooled dataset, we find that the number of years of schooling attained by mothers correlates with a lower likelihood of stunt-

ing. An additional year of education for the mother is also associated with a higher ECDI score. However, higher maternal education is correlated with a higher likelihood of children being overweight. Further analysis shows that this effect varies across countries.

We examine further potential mechanisms behind the impact of the number of years of schooling attained by mothers on children’s well-being outcomes. We find that providing ECE and better care practices are two important mediating factors that explain the indirect effects of the number of years of schooling. We further find evidence that the number of years of schooling attained by mothers has a direct effect on reducing the likelihood of 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 the nurture framework in predicting the relationship between maternal education and children’s well-being. This section presents the specific challenges in the Pacific in terms of children’s well-being. In Section 3, we describe the survey dataset used in the main analysis and the main variables. We discuss our main estimation strategy in the fourth section. The fifth section presents and discusses the main results. Next, we perform several sensitivity checks in Section 6. Finally, Section 7 concludes our research.

2 Context

2.1 Nurture framework

Previous studies provide compelling evidence that shows significant well-being gaps between children from high-socioeconomic-status families and their counterparts from low-economic-status families. There is a positive association between maternal education and children’s well-being, especially in terms of children’s health status. Glewwe (1999), Chen and Li (2009), and more recent studies by Rubio-Codina and Grantham-McGregor (2019) and Cuartas and McCoy (2021) show that there is a positive association between maternal education and children’s well-being. After controlling for the parents’ health status (nature), these researchers find that more educated parents provide better healthcare and nutrition, which leads to lower incidences of stunting and malnutrition. Furthermore, well-educated mothers were also found to practice better hygiene in childcare and to provide safer environments (Currie and Moretti (2003); Thomas, Strauss, and Henriques (1990)). Thus, most of the previous studies indicate that nurture is the key mechanism behind the positive association between children’s well-being and the wealth status of their original household, as opposed to the nature mechanism.

Nevertheless, the nutritional literature also shows mixed results concerning the relationship between maternal education and children being overweight. On the one hand, previous literature shows a positive association between a low economic status and overweight children. They find that children from a household with a single mother (Gibson et al. (2007)), an obese mother (Hesketh et al. (2007)), or a low family income tend to be overweight (Gibson

et al. [2016]). This low economic status indirectly implies a less educated mother. However, there has been a growing body of literature showing a negative correlation between maternal education and childhood obesity that includes studies performed in the People's Republic of China (Feng et al. [2019]), Sub-Saharan Africa (Makoka and Masibo [2015]), and South America. Maternal education might affect childhood obesity via the type of employment (Fertig, Glomm, and Tchernis [2009]). While higher employment translates to a higher calorie intake via the income effect, it can also affect eating styles; there may be more takeaway consumption and eating while watching TV. Maternal education and childhood obesity may also be interconnected via excessive early breastfeeding (Feng et al. [2019]). Lastly, greater maternal education causes mothers to have specific occupations that require less physical activity. This potentially also correlates with less physical activity within the household.

Beyond health status, a positive association between the mother's well-being and education is also evident in children's cognitive and emotional development. Maternal education is associated with children's cognitive development via a better knowledge of educational choices. Meanwhile, the psychological literature suggests a direct link between maternal well-being and children's well-being. The mother's happiness is found to be a good predictor of children's cognitive and emotional outcomes (Amato [1994]; Berger and Spieß [2011])

2.2 The Pacific context

The Pacific consists of small archipelagic countries that are vulnerable to severe and recurring natural disasters. The interaction of frequent natural disasters and a challenging geography affects investment in physical capital to yield low to modest economic returns (Utz [2021]). Consequently, this highlights the importance of human capital investment for achieving sustained economic growth and development. The Human Capital Project¹ of the World Bank, for instance, highlights the importance of investing in children's education and nutrition as key factors behind poverty reduction and sustained economic growth in the Pacific². A collection of evidence from across developing countries shows that investing in early childhood development is the foundation of human capital accumulation (Daelmans et al. [2017]). The Pacific, however, has several unique challenges and opportunities in terms of investing in early childhood development.

Overall, in the Pacific, the majority of adult females have access to secondary education. On average, about 60% of adult women have attained secondary education (World Development Indicator). Moreover, in most Pacific Island countries, the secondary net enrollment rate (NER) is significantly higher for girls than for boys. One explanation for the gender dispar-

1. The Human Capital Project is an ambitious global effort to accelerate more and better investment in people for sustained growth. More information on this project can be found using the following link: <https://www.worldbank.org/en/publication/human-capital>

2. See <https://www.worldbank.org/en/news/feature/2019/11/07/human-capital-in-the-pacific-islands-and-papua-new-guinea> (accessed 5 January 2023).

ity (in favor of girls) in secondary education 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.

Meanwhile, there are still significant barriers to education, including the vast geographical dispersal of the islands, which poses a serious challenge when it comes to accessing quality education. Poor internet connectivity and infrastructure also impede the development of on-line/remote training alternatives to address these geographical challenges. Several Pacific Island countries, such as Tonga and Tuvalu, which are among the countries we are interested in, 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 from it.

Despite relatively high educational attainment, the Pacific Island countries have specific challenges in terms of children’s and women’s well-being (Blankenship, Rudert, and Aguayo 2020). First, compared to other developing countries, Pacific children are more likely to suffer from obesity, leading to a higher likelihood of non-communicable disease (NCD) in later life. According to a recent analysis of the Global Burden of Disease (GBD) Study, NCD is the main cause of illness and death in the Pacific Island countries, accounting for more than three-fourths of all deaths, with an economic burden that is greater than expected for middle-income countries (Hou, Anderson, and Burton-Mckenzie 2022). This 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 Pacific. 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 Pacific countries (UNICEF 2017).

Second, the Pacific also suffers from high levels of gender-based violence according to the World Bank Gender Data Portal.³ 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% (UNICEF 2017). Various childhood, 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, support and facilitate violence against women and girls. This type of violence has been linked to several mental, physical, sexual, and reproductive health outcomes. Although the status of women has been improving in the Pacific, women are still frequently viewed

3. World Bank. [Gender Data Portal](#) (accessed 6 December 2022)

as subordinate to men, and gender roles remain quite rigid. According to the results of the Family Health and Safety Studies (UNFPA, 2006, 2010, 2014), the widespread prevalence of physical and sexual partner violence can be traced back to entrenched gendered social norms that justify this treatment of women as a necessary and even deserved form of discipline for those who fail to adhere to traditional gender roles.

From a cultural perspective, a typical Pacific nation household has a large number of members and cohabitation with extended families, and people often live close to their relatives. On one side of the coin, this could lead to potential informal childcare support that may or may not mask the importance of maternal knowledge. On the other side, living in a larger family may also increase resource competition, especially for younger household members, as predicted in the 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 in which extended family networks are strained. Concerns have also been 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 (Adelman and Ivaschenko 2014).

The countries that we study, except for Kiribati, share similar Gross Domestic Product (GDP) per capita. However, children's well-being indicators show significant variations. Despite a potential link between the GDP per capita and children's nutritional status, for some countries, a higher GDP per capita does not necessarily mean a better nutritional status for children. For instance, Kiribati, with the lowest GDP per capita, has the highest underweight and stunting incidences of 6.9% and 15.2%, respectively, of children less than 5 years old. Nevertheless, Tonga's percentage of underweight children (0.8%) is significantly lower than Samoa's (3.4%) and Tuvalu's (2.9%), even though their GDPs per capita are about the same. Similarly, in terms of stunting, Kiribati has the highest share, with 15.2% of children less than 5 years old whose height-for-age is more than two standard deviations below the median of the reference population. Kiribati is followed by Samoa (7.3%), Tuvalu (5.7%), and Tonga (2.2%), and substantial variation is also observed among these three countries.

Our analyzed dataset confirms such variations. In terms of weight and height measurements, as summarized in Figure A4A and B, we observe that in Kiribati and Samoa, more children have lower-than-the-median weight-for-age and height-for-age z-scores compared to their counterparts in Tonga and Tuvalu. Figure A4C suggests that the overweight problem is more prevalent in Samoa compared to Kiribati, Tonga, and Tuvalu. In terms of the ECDI score, as illustrated in Figure A4D, the medians of the ECDI scores across the four countries are similar but the distribution varies. More extreme-low score cases are found in Tonga and

Samoa than in Tuvalu, for instance. Finally, the four countries share a similar median maternal number of years of schooling. However, Figure A4 shows us that, across countries, variation in mothers' educational attainment does exist. Thus, our study benefitted from the similarity of the institutional and economic backgrounds of the analyzed countries and, at the same time, from the variation in the outcomes and maternal education of these countries.

Along the same lines, the provision of public goods and strategies related to early childhood development and maternal well-being also vary. The majority of the Pacific Island countries have formulated national development plans or strategies, which serve as a source of direction for the government and often cover a period of 3 to 10 years. Due in large part to the fact that many of the countries in the Pacific are dependent on official development assistance (ODA), economic growth is a central component of many of these plans. However, the social protection system that enables households to invest in children's well-being and human development is very limited and largely varies across countries. In Kiribati, although the provision is limited, there is a social assistance measure focused on school fee schemes and the provision of cash payments to incapacitated parents of secondary school children (UNICEF, 2017). Samoa has subsidized fee-free primary schools, but there is no cash transfer system for vulnerable children or families (UNICEF, 2017). Meanwhile, in Tuvalu and Tonga, currently, there are no social assistance programs 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 a financial commitment.

3 Data

3.1 MICS

This study uses the Multiple Indicator Clustering Survey (MICS), which is a multi-round cross-sectional harmonized household survey implemented by the United Nations Children's Fund (UNICEF) that focuses on mothers' and children's outcomes across low-income countries.⁴ Since the inaugural round in 1990, in addition to Vanuatu (surveyed from 2007–2008), the survey began to include more Pacific countries from 2019–2020; these countries will be the focus of this research. In regard to our study, this survey helps to fill information gaps in the Pacific countries where a national socioeconomic survey is lacking. The survey is purposely designed to provide key indicators of children's well-being. The survey is also comparable to the Demographic and Health Surveys (DHS) carried out by the United States Agency for International Development (USAID); however, it typically has a smaller number of observations

4. The MICS dataset is publicly available at <https://mics.unicef.org/surveys>.

and provides less detailed information.

In this study, we use the sixth round of the MICS, which was conducted between 2019 and 2020, for Tonga, Kiribati, Samoa, and Tuvalu. The survey focused on children under five years old, and women and men aged 15–49 years old and their household members were interviewed. The sampling frame of the MICS is designed to provide estimates that are representative of the national level and urban and rural areas. We find that the MICS suits our purpose since the questionnaire includes a rich array of children’s well-being outcomes, including their nutritional status, education, and cognitive development. The MICS also provides detailed information on mothers’ characteristics and childcare practices within households. For our main analysis, we restrict our sample to children aged 0 to 59 months old who live in the same household as their mothers. For the ECDI modules, the survey only interviews the caretakers of children aged at least 35 months 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 was administered to the mother of each child.

Our main sample consists of children aged 0–4 years old who cohabit with at least their mother. It yields a total of 6,714 out of 6,718 total surveyed children; almost every child identifies their mother as their main caregiver.⁵ Out of 6,714 children, 182 children lived in a household where fathers were not present during the time of the survey. The survey consists of a balanced composition of male and female children. About 52% of the 6,714 total children in the main analysis were male.

3.2 Main variables

Nutritional status

The first aspect of children’s well-being that we consider is their nutritional status. First, we use the incidence of stunting as a measure of nutritional status. We follow the World Health Organization (WHO) definition, as we define a child as stunted if his/her age-adjusted height (height-for-age) z-score lies two standard deviations below that of his/her reference group.

Our second measure of nutritional status is whether the child is overweight. Most studies that examine the nutritional status and maternal well-being provide less attention to children being overweight. Being overweight is defined as having an age-adjusted body mass index (BMI) greater than two standard deviations away from that of the reference population. Consequently, very limited empirical evidence has been used to shed light on the relationship between maternal well-being and obesity. However, it is widely known that Pacific countries have the highest rate of obesity for adults in the world. Additionally, childhood obesity is a predictor of adult obesity.

5. About 99.94% of the children in the sample identified their mothers as their main caregivers.

Table 1: Descriptive statistics

	Kiribati	Tonga	Tuvalu	Samoa	Total
<i>Child characteristics</i>					
Total child sample	2179 (.)	1347 (.)	501.0 (.)	2687 (.)	6714 (.)
Stunted (=1)	0.137 (0.344)	0.0141 (0.118)	0.0415 (0.200)	0.0429 (0.203)	0.0665 (0.249)
Overweight (=1)	0.0170 (0.129)	0.130 (0.336)	0.0428 (0.203)	0.0742 (0.262)	0.0661 (0.249)
Height-for-age	-1.034 (1.103)	0.159 (0.988)	-0.407 (1.062)	-0.102 (1.253)	-0.364 (1.235)
Body mass index	15.74 (1.193)	16.84 (1.658)	15.95 (1.515)	16.19 (1.597)	16.17 (1.542)
ECDI—overall	0.774 (0.152)	0.733 (0.181)	0.657 (0.157)	0.670 (0.228)	0.717 (0.197)
ECDI—learning	0.788 (0.333)	0.904 (0.261)	0.771 (0.322)	0.753 (0.354)	0.799 (0.331)
ECDI—socioemotional	0.777 (0.253)	0.712 (0.266)	0.680 (0.292)	0.649 (0.315)	0.707 (0.289)
ECDI—physical	0.843 (0.236)	0.691 (0.301)	0.768 (0.266)	0.748 (0.318)	0.767 (0.292)
ECDI—cognitive	0.716 (0.293)	0.669 (0.322)	0.485 (0.354)	0.582 (0.374)	0.638 (0.344)
Cronbach’s alpha	0.462 (.)	0.558 (.)	0.323 (.)	0.673 (.)	0.555 (.)
<i>Mediating variables</i>					
Mother’s care practice score	1.996 (2.319)	2.710 (2.586)	2.016 (2.368)	2.202 (2.463)	2.221 (2.448)
Child attends early childhood education	0.320 (0.467)	0.162 (0.369)	0.326 (0.469)	0.121 (0.326)	0.210 (0.407)
Mother’s happiness score	0.535 (0.499)	0.672 (0.470)	0.741 (0.439)	0.663 (0.473)	0.627 (0.484)
Mother experiences domestic violence	0.492 (0.500)	0.461 (0.499)	0.548 (0.498)	0.559 (0.497)	0.517 (0.500)
Child physical punishment score	1.847 (1.781)	1.717 (1.704)	1.197 (1.357)	1.353 (1.509)	1.578 (1.651)
<i>Parents’ characteristics</i>					
Mother’s age	31.24 (8.188)	33.07 (8.936)	32.86 (10.21)	32.10 (9.232)	32.07 (8.943)
Mother’s years of schooling	10.25 (2.567)	11.40 (2.357)	12.14 (2.905)	12.46 (2.271)	11.50 (2.616)
Father’s age	23.91 (15.98)	23.16 (17.80)	22.47 (17.06)	26.91 (17.27)	24.86 (17.04)
Father’s years of schooling	6.947 (5.011)	7.045 (5.711)	7.232 (6.167)	8.297 (5.914)	7.527 (5.646)
Father does not live in household (=1)	0.0255 (0.158)	0.0276 (0.164)	0.0388 (0.193)	0.0301 (0.171)	0.0287 (0.167)
Live in urban area (=1)	0.528 (0.499)	0.211 (0.408)	0.650 (0.478)	0.162 (0.368)	0.326 (0.469)
Index of household assets	0.713 (0.453)	0.979 (0.142)	0.994 (0.0742)	0.885 (0.320)	0.855 (0.352)
Live with extended family (=1)	0.724 (0.447)	0.620 (0.486)	0.882 (0.323)	0.784 (0.411)	0.738 (0.440)

Authors’ calculation based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers is used. Statistics are weighted using the sample weights provided by the survey.

Childhood development

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

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

Although the set of questionnaires used to proxy the ECDI has been standardized and follows the UNICEF framework closely, it is possible that given the sample size, the interview method, and other factors, the internal reliability of such questions might be affected. To test this, we compute Cronbach's alpha (Cronbach 1951) to test the internal reliability of 10 asked questions. Cronbach's alpha computes the correlation between two random samples of items from a module of items, such as, for instance, a test. Higher alpha coefficients suggest that a test has a higher internal consistency, and hence they suggest that a test can reliably measure the intended outcomes. Overall, the resulting Cronbach's alpha lies below the standard acceptable threshold of 0.60 (Taber 2018).⁶ Respectively, the alpha coefficient ranged from 0.33 to 0.67, where Tuvalu has the lowest coefficient and Samoa has the highest coefficient. Despite this limitation, this index is the only reliable source of information regarding early childhood development. The information is used as an interim indicator for reporting on goal 4.2.1 of the Sustainable Development Goals (SDGs) in the corresponding countries.

We construct ECDI scores by taking the average across 10 binary items. By construction, our ECDI takes a value from 0 to 1, where a higher value represents a higher development index. If a child satisfies all the development indicators, he/she takes the highest value of 1, and the value 0 is used otherwise. The measure can also be interpreted as indicating how well a child achieves the bare minimum of childhood indicators according to their age. More information on the outcome distributions is summarized in Figure A3 in the Appendix.

Alternatively, we construct ECDI scores following the UNICEF definition of childhood development tracking. A child is considered to be on track for overall childhood development if he/she is on track in at least three domains. To be considered on track for the learning

6. In practice, many argue that the acceptable threshold ranges from 0.70 to 0.95 (Tavakol and Dennick 2011).

domain, the child must be on track for at least one item. To be considered on track for the physical domain, the child must be on track for at least one item. To be considered on track for the socioemotional domain, the child must be on track for at least two items. To be considered on track for the literacy domain, the child must be on track for at least two items. The results are summarized in Figure [A10](#) in the Appendix.

Maternal education

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

As mentioned in subsection [2.2](#), the survey data also reflect high access to secondary education for mothers. From Table 1, it emerges that, on average, the mothers of the children sampled in the main analysis completed 11 years of education. In other words, about 46% of children’s mothers attended upper secondary education. It is also found from the main analyzed data that a given child’s mother is slightly more educated than their father. We illustrate the distributions of the number of years of schooling for fathers and mothers by country in Figure [A1](#) in the Appendix.

Given the unusually high level of education of the women in the analyzed sample, one may consider that the simple years of schooling measurement may not capture the variation in maternal education. On the other hand, measuring the number of years of schooling might not be able to capture the learning gained from the education itself. Thus, we consider the following alternative measures of maternal education. First, we consider the gap to the completion of second grade. Second, we also consider the difference between the actual number of years of schooling and the compulsory education level. The compulsory level of education varies across countries. Lastly, we construct a dummy variable that indicates if a mother has more years of schooling compared to the median value for mothers. We test the relationship of each proxy of maternal education to the children’s outcomes in Section [5](#).

4 Estimation strategy

4.1 Baseline estimation

We adopt the approach of Cuartas [2022](#) to estimate the linear correlation between the number of years of schooling of mothers and children’s well-being. The following equation summarizes the linear specification used to estimate the correlation between maternal education and children’s well-being for the pooled sample of four countries.

$$Y_{ihrc} = \alpha_0 + \alpha_1 \text{MotherYoS} + \alpha^k X + \kappa_c + \epsilon_{ihrc}. \quad (1)$$

Where Y is the well-being outcome of children i at household h who live in the region r and country c . Our main maternal education variable is the mother's number of years of schooling (*MotherYos*). We measure the number of years of schooling as the number of years of completed education rather than as the highest attended education grade. We include a vector of covariates (X), which include the children's age, the mother's age, the father's age, the father's number of years of schooling, an urban dummy variable, an index of household assets (UNICEF, 2017), an indicator variable that indicates if the child lives with extended family, and a dummy variable that indicates if the father of the children did not live in the household at the time of the survey. Finally, we also control for country fixed effects (κ_c). We cluster our standard errors at the regional level.

Similarly to equation [1](#), we also perform country-specific estimates to disentangle the impact of mothers' levels of education. The estimation framework becomes the following:

$$Y_{ihrc} = \alpha_0 + \alpha_1 \text{MotherYoS} + \alpha^k X + \epsilon_{ihrc}. \quad (2)$$

Most women in the Pacific have at least a secondary education, and their rates of education attainment are higher than those of men. Therefore, the marginal effect of more schooling may not be linear. As an alternative, we utilize a variety of measures of maternal education. Our first alternative variable is the gap to completing country-specific compulsory education. This variable simply measures the difference between the actual completed number of years of education and the corresponding compulsory education level in the country. As a second alternative measurement, we use the gap to secondary school completion. For instance, if a mother completed eight years of schooling, the gap to completing secondary school is four years (assuming 12 years to complete secondary school).

Although this paper does not claim causality, for the reader's benefit, we discuss the potential endogeneity issues of examining the causal effect of maternal education on children's well-being. First, highly educated mothers may transfer a particular individual trait or ability to their children. For instance, a mother with a high cognitive ability would likely have children with a high cognitive ability. Hence, the quality of education does not matter much to the children's well-being when this well-being is measured in terms of cognitive outcomes since it can be largely explained by genetics. Second, education decisions may also be endogenous. For instance, mothers who attained a higher level of education were likely to come from a high-socioeconomic-status family, which, through intergenerational transfer, affected their current socioeconomic status. Hence, her children's well-being is no longer a matter of the mother's education but depends on access to more resources. Third, there are several potential omitted variable biases in the estimation, given the unobservable information from the survey. As an example, the parenting style would affect children's well-being and corre-

lates with maternal education (either directly or indirectly) but is challenging to measure in the survey. Given the endogenous education decision and the potential omitted variable bias issues, in our additional analysis, we apply an instrumental variable strategy.

As part of our additional analysis and robustness check, we employ an instrumental variable approach to deal with this endogeneity issue. We use the education of the peers of the mother as an instrument to measure the mother's years of schooling. The two-step procedure is summarized as follows:

$$MotherYoS = \beta_0 + \beta_1 PeerMotherYoS + \beta^k X + \kappa_c + \epsilon_{ihr}, \quad (3)$$

$$Y_{ihrc} = \delta_0 + \delta_1 \hat{MotherYoS} + \delta^k X + \kappa_c + \epsilon_{ihr}. \quad (4)$$

The peers are defined as a group of people who share a birth cohort, region of residence, and country of residence. The rationale for the validity of the instrument is as follows. We argue that peer education is a good candidate for an instrumental variable for the following reasons. First, it satisfies the relevance assumption, as peer education may strongly affect a mother's education. On the one hand, empirical findings have shown significant peer effects on groups of women in terms of education, fertility, and employment decisions (Kavas and De Jong [2020](#); Kandpal and Baylis [2019](#); McCrary and Royer [2011](#)). On the other hand, peer education also captures education policies applied to particular birth cohorts. Second, we claim that the education of a mother's peers is less likely to directly affect her own children's well-being. Peer education might affect one's own children's education only via their own mother's education or if one believes that there is such a spillover effect from the community. We do admit that the spillover effect is plausible, and hence the exogeneity assumption is weakly implied. Nevertheless, we construct a mother's peers' education as a leave-one-out means of measuring education such that one mother's education does not contaminate a peer's education.

5 Results

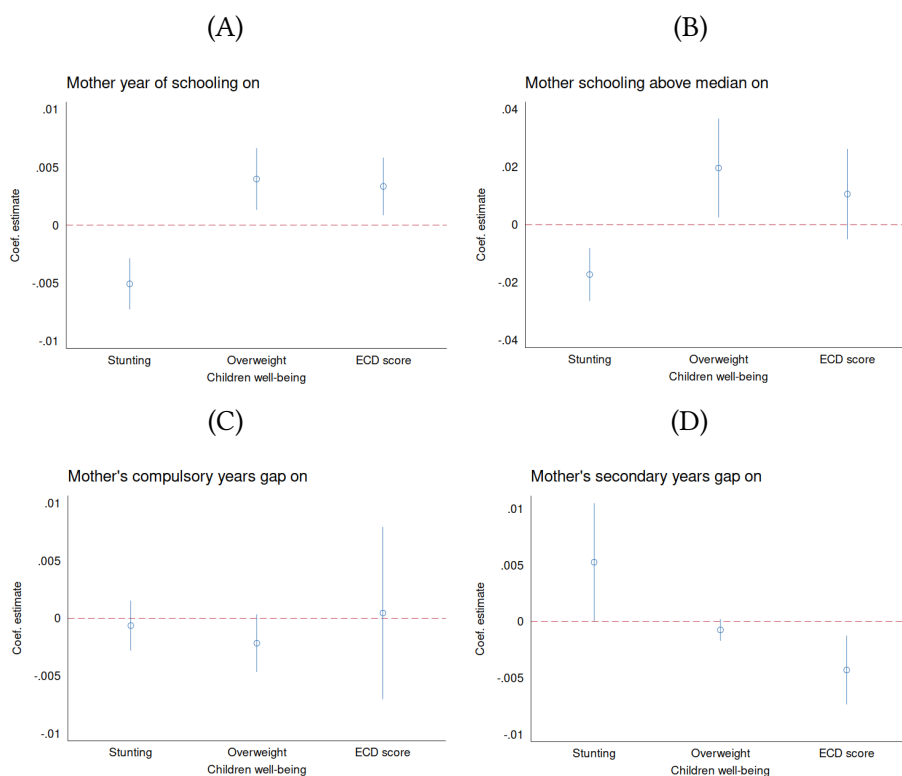
5.1 Regression analysis

We start with Figure [1](#), which summarizes the effect of maternal education, proxied by several alternatives, on children's well-being. This plot refers to equation [1](#). Each panel in Figure [1](#) represents a separate regression on the pooled samples of countries. From panels A and B, it emerges that using the number of years of schooling and the dummy variable of having a number of years of schooling that is higher than the median, maternal education is associated with a lower likelihood of stunting and has a positive effect on the likelihood that a child is overweight. However, the two measurements disagree on the effect on the ECDI score. The

years of schooling model captures a positive effect on the ECDI; meanwhile, having more years of schooling than half of the mothers in the sample has a positive but not statistically significant correlation with the ECDI. From panels C and D, we learn that maternal education has no effect on any of the child’s well-being indicators.

We also provide estimates for a set of alternative outcomes, as presented in Figure A8 in the Appendix. For this study, we argue that using the number of years of schooling instead of a dummy variable that indicates if a mother’s number of years of education is above the median as a better proxy of maternal education captures more variation along the incremental increase in the level of education.⁷ Thus, we focus on the years of schooling variable for the rest of the discussion. The full results can be found in Table A1 in the Appendix.

Figure 1: Maternal education proxies and children’s well-being



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children’s age, mother’s age, father’s age, father’s years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Next, we consider our model separately for each country. The coefficient of estimates plotted in Figure 2 corresponds 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 a

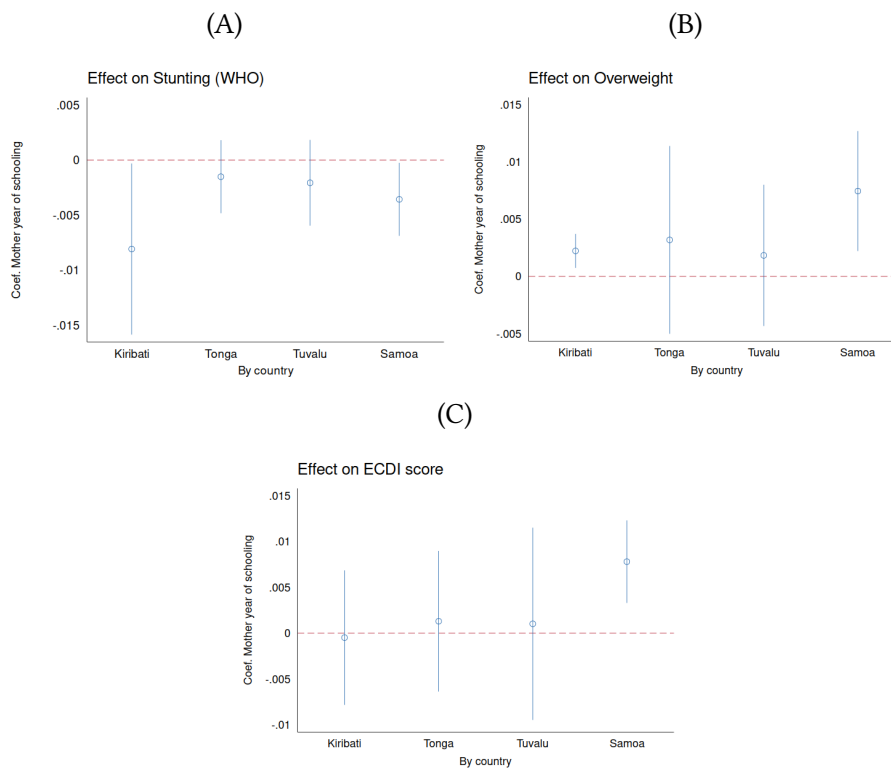
7. A comparison of the children’s well-being outcomes between mothers who had below and above the median of the number of years of schooling is summarized in Figures A5 and A6 in the Appendix.

lower likelihood of stunting. The coefficient, albeit small, is substantive considering the incidence of stunting in the corresponding countries. An additional year of schooling corresponds to 5.4% ($\frac{0.07}{0.13}$) and 6% ($\frac{0.004}{0.6}$) reductions in the stunting incidence.

Regarding the likelihood of a child being overweight, (see Figure 2B), we find that a positive correlation between maternal education and children being overweight is driven by the Kiribati and Samoa results. We find empirical evidence that suggests that a higher maternal education correlates with a higher incidence of being overweight. This supports previous findings (Feng et al. 2019; Makoka and Masibo 2015; Fertig, Glomm, and Tchernis 2009) that show a positive correlation between maternal education and obesity. Regarding previous studies, one possible explanation is that maternal education affects obesity via employment effects. A highly educated mother is likely to participate more in the labor market. Thus, this could affect eating behavior; for example, more takeaway food may be eaten due to the limited time available for food preparation. It is also possible that children with highly educated mothers will be less likely to be involved in child labor as family workers. Mothers with high education levels would likely be participating in formal occupations. Meanwhile, a child with a less educated mother may be more likely to be involved in physical labor as a family worker, which affects their physical activity intensity.

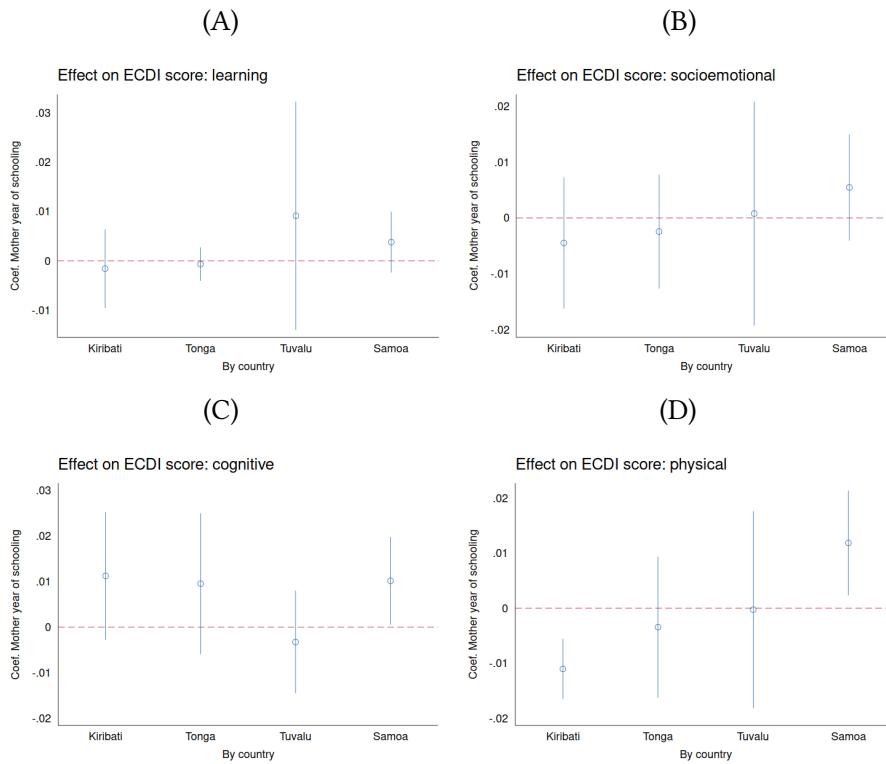
Lastly, we find that a positive correlation between maternal education and the ECDI score is driven by the Samoan sample (see Figure 2C). In most countries, maternal education has a null correlation with the ECDI score, except for Samoa. This could relate to our early concern about the low reliability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

Figure 2: Maternal education and children's well-being by country



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Figure 3: Maternal education and ECDI components



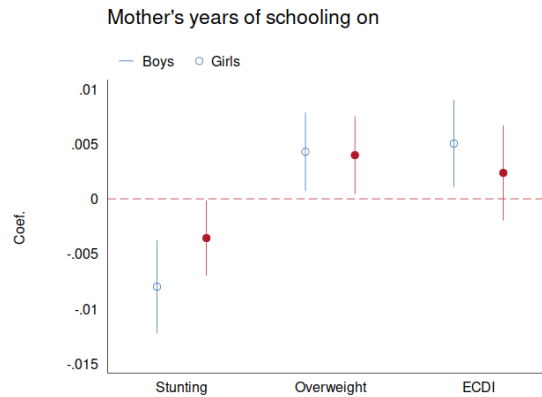
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children’s age, mother’s age, father’s age, father’s years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

5.2 Heterogeneity results

Gender

Previous studies (Handa [1999](#); Rashad and Sharaf [2019](#); Quisumbing et al. [2021](#)) provide inconclusive evidence on whether the empowerment of mothers would disproportionately provide advantages for either boys or girls. As summarized in Figure [4](#), we find several interesting insights from our results. First, we find that the negative maternal education correlation with stunting is slightly larger for boys compared to girls. However, the difference in the coefficient of association between boys and girls is not statistically significant. Similarly, for both the ECDI score and the likelihood that a child is overweight, we find very similar results for boys and girls. Thus, in our results, we do not find a gender bias in terms of children’s outcomes as one might expect due to the existence of a preference for sons in the Pacific culture.

Figure 4: Maternal education and ECDI components

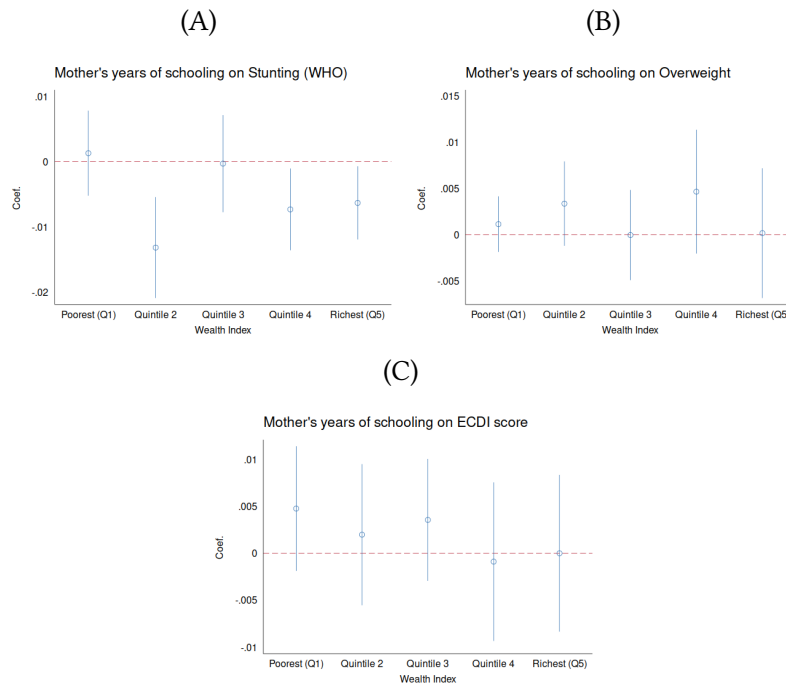


Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Household wealth

Next, we investigate whether household income levels affect the relationship between a mother's number of years of schooling and her children's well-being. Figure 5 illustrates the findings. Household wealth could be an important moderating factor that affects the relationship between maternal education and children's well-being. For instance, if maternal education affects children's well-being via the employment and income effect, a weaker association between maternal education and children's well-being is expected for those from high-income households. Since the MICS does not provide a direct measure of income, we use an index of wealth provided by the survey, which groups households into five quintiles based on asset ownership. We find that in terms of the stunting incidence outcome, as shown in Figure 5A, children from the second-poorest households experience the largest benefit from maternal education compared to those coming from richer households. Surprisingly, for those from the poorest households, maternal education is not associated with a lower stunting incidence. One may interpret this as evidence that maternal employment is an important mediating factor in children's nutritional outcomes. Mothers from the poorest families are likely to be less educated and to hold low-paying jobs. Hence, the incremental effect of additional education on children's well-being becomes too small within the poorest households. On the contrary, a positive association between maternal education and the likelihood of being overweight and the ECDI score is shared equally across different levels of household wealth (see Figure 5B and C).

Figure 5: Maternal education and children’s well-being, by household wealth quintile group



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children’s age, mother’s age, father’s age, father’s years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

5.3 Mediating variables

Previously we found evidence that shows a positive association between maternal education and the likelihood that a child is overweight and the ECDI score, although this association is weak, as well as a negative correlation with the stunting incidence. In this subsection, we examine further factors that significantly affect children’s well-being outcomes. In other words, we look into several mediating factors that are correlated with children’s well-being. Figure [A7](#) summarizes such mediating effects and the direct effects of the number of years of schooling on children’s well-being.

We focus on five potential mediating variables of maternal education that affect children’s well-being (Cuartas and McCoy [2021](#)). The first mediating variable is the mother’s care score. The care scores are constructed using a set of unique questionnaires that consider several caring practices. We first use information that determines whether any household member aged at least 15 years old engages in the following activities with the corresponding child: reading books, telling stories, singing songs, taking outside, playing with the child, drawing, and counting things. We construct a score based on the number of care practices performed by the mother. We then combine this score with the child’s vaccination status and public

health utilization to create a composite score of the mother's care practices.

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

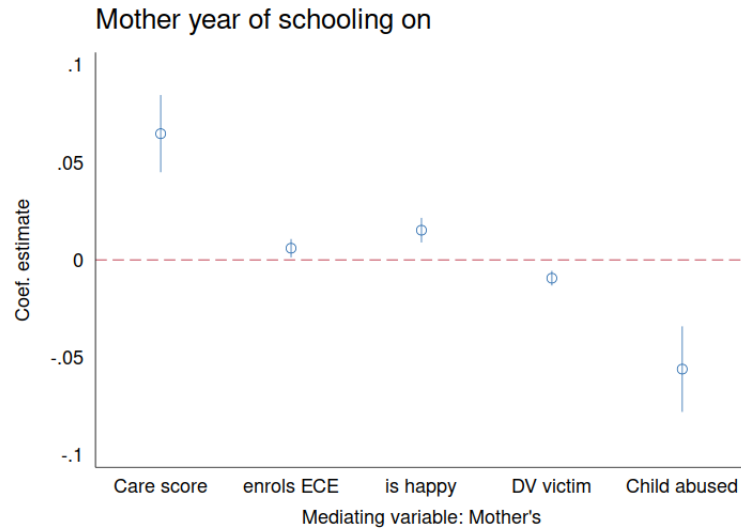
The third mediating variable is the mother's happiness, where a higher value represents a greater happiness level. Amato [1994](#) found that the mother's well-being, including her psychological well-being, is an important factor that affects children's well-being. The mother's well-being affects the relationship between the mother and her 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. Then, we construct a score that indicates the number of physical punishment methods used to discipline children in the household. The survey lists 12 methods of disciplining a child, where six of them involve direct physical contact, which includes (i) shaking him/her, (ii) spanking him/her on the bottom with a bare hand, (iii) hitting the bottom with a hard object(s), (iv) slapping him/her in the face, (v) hitting or slapping him/her on the hand, arm, or leg, and (vi) beating him/her as hard as one could.⁸ The score is a linear additive of each binary response from the adult respondents.

We begin by establishing the correlation between the number of years of schooling of the mother and the mediating variables. We estimate the impact of each of the mediating variables on the mother's years of schooling using the same covariates used in equation [2](#). Figure [6](#) summarizes the results. We find evidence that suggests that the number of years of schooling of the mother has a positive association with a higher care score, the enrollment of children in ECE, and happiness. On the opposite side, the mother's years of schooling have a negative correlation with the mother being a domestic violence victim and using physical punishments on children.

8. The rest of the discipline methods include taking away privileges or not allowing children to leave the house, giving them something else to do, shouting or yelling at them, explaining what was wrong, and locking or tying the child up (only available in Kiribati).

Figure 6: Mediating variables and maternal education

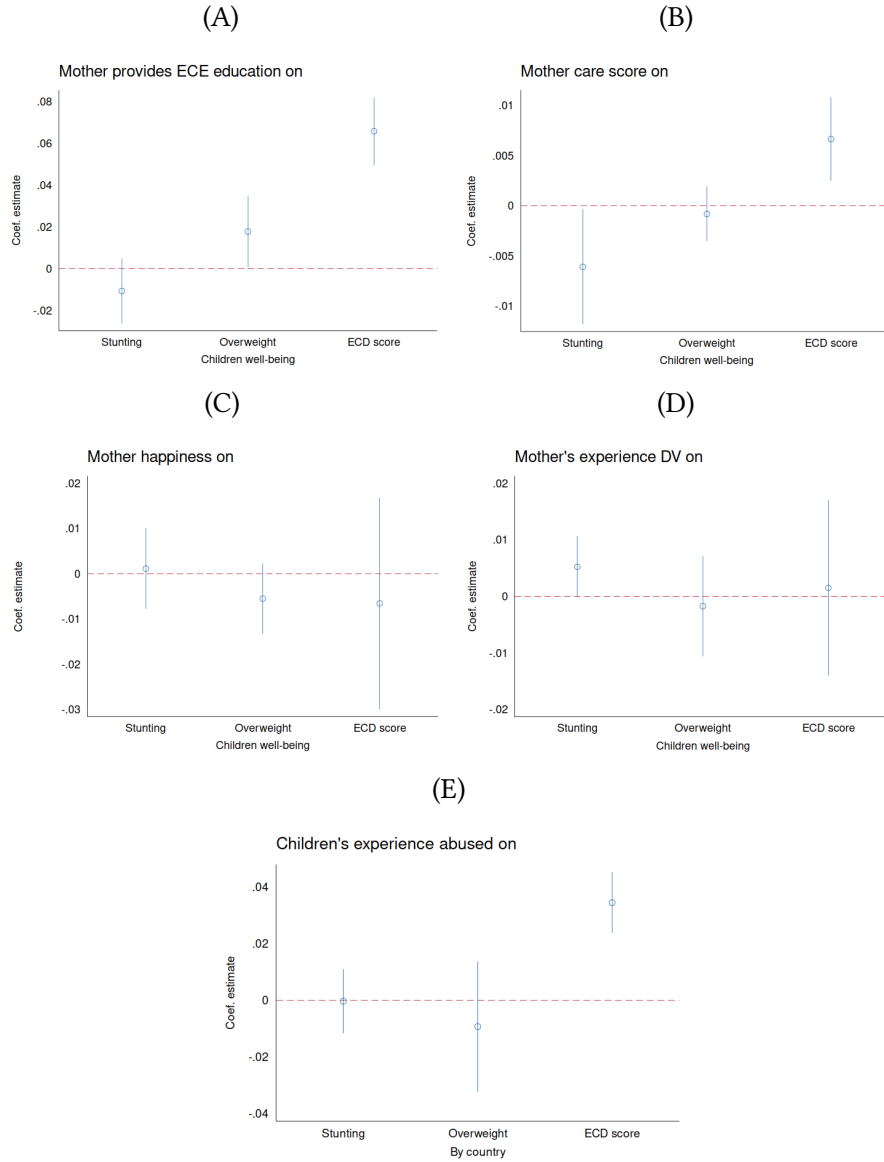


Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children’s age, mother’s age, father’s age, father’s years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Next, we test if there exists a correlation between the mediating variables and children’s well-being. This is similar in spirit to equation 2, but now we estimate children’s outcomes using each of the mediating variables. The results are summarized in Figure 7

From Figure 7A, we find evidence that enrolling children in ECE positively correlates with the ECDI score but not the other outcomes. From panel B, we find that the mother’s care score is negatively correlated with stunting and positively correlated with the ECDI score. We find no evidence that the mother’s happiness is correlated with the children’s well-being; however, the mother’s happiness does seem to correlate with children being less overweight. We also do not find convincing evidence of a correlation between mothers being victims of domestic violence and their children’s well-being (see panel D). Surprisingly, we find that physical punishment has a positive correlation with the ECDI. Further investigation shows that these results are driven by the positive correlation between physical punishment and the physical dimension of the ECDI. We present the table that corresponds to Figure 7 in Table A2 in the Appendix.

Figure 7: Mediating variables and children's well-being



Notes: The results are based on the MICS dataset.

Finally, we want to test whether controlling for the mediating variables will absorb all of the effect of the years of schooling. In practice, we estimate the following:

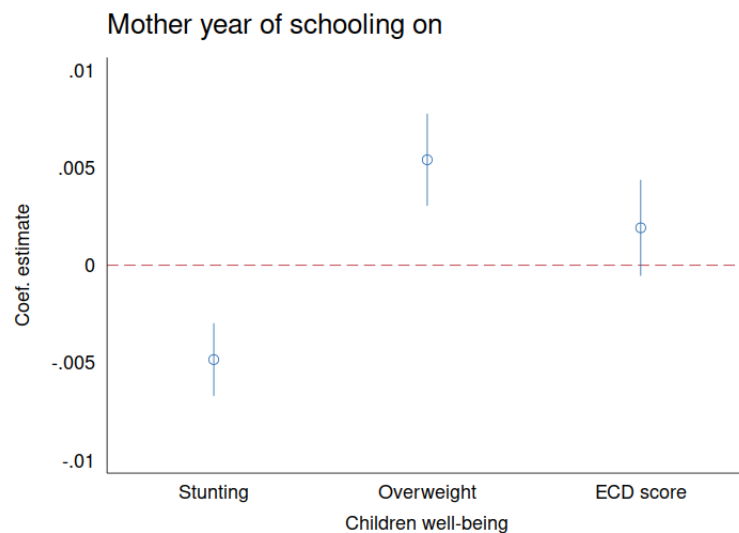
$$Y_{i,h,r,c} = \gamma_0 + \gamma_1 \text{MotherYoS} + \theta \text{Mediating} + \gamma^k X + \kappa_c + \epsilon_i, h, r. \quad (5)$$

If the number of years of schooling affects children's well-being via all the mediator variables, we expect $\gamma_1 = 0$. The case in which $\gamma_1 \neq 0$ could be interpreted in two ways. First, it presents evidence of the direct effect of the number of years of schooling on children's well-being. Second, the non-null effect of the number of years of schooling after controlling for the mediating variables may serve as evidence of the omitted mediating variables issue.

From Figure 8, we learn that $\gamma_1 < 0$, $\gamma_1 > 0$, and $\gamma_1 = 0$ for the likelihood of stunting, the

likelihood of children being overweight, and the ECDI score, respectively. For the ECDI score, the mediator variable seems to capture all the effects from the number of years of schooling, and the direct effect of the number of years of schooling seems to be null. On the other hand, for the stunting and overweight outcomes, we find evidence that there is a direct effect of the number 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 the number of years of schooling to check for the existence of direct effects of the number of years of schooling. We present the table that corresponds to Figure 8 in Table A4 in the Appendix.

Figure 8: Mediating variables and maternal education



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children’s age, mother’s age, father’s age, father’s years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Motivated by our previous findings, we test for the direct effect of the number of years of schooling using the instrumental variable approach. As mentioned in Section 4, we employ mothers’ peers’ education as a leave-one-out measure of maternal education. We argue that peer education potentially affects mothers’ education via the confounding education policy exposure of particular birth cohorts and social conformity. We also argue that peers’ 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 peers’ years of schooling and the mother’s years of schooling. The coefficient of correlation is 0.2 ($t = 6.10$), with the Kleibergen-Paap rk LM statistic being 36.159. A full report on the two-stage least-squares (2SLS) regression is available in Table A3 in the Appendix.

Figure [A11](#) in the Appendix summarizes our main estimate of interest from the second-stage regression. It suggests that the number of years of schooling has a causal effect on stunting outcomes but not on other outcomes. Using these results, we argue that for the overweight and ECDI outcomes, the number of years of schooling has zero direct effects, but we potentially excluded important mediating factors. However, for the stunting outcome, we observe that direct effects from the number of years of schooling exist.

6 Sensitivity checks

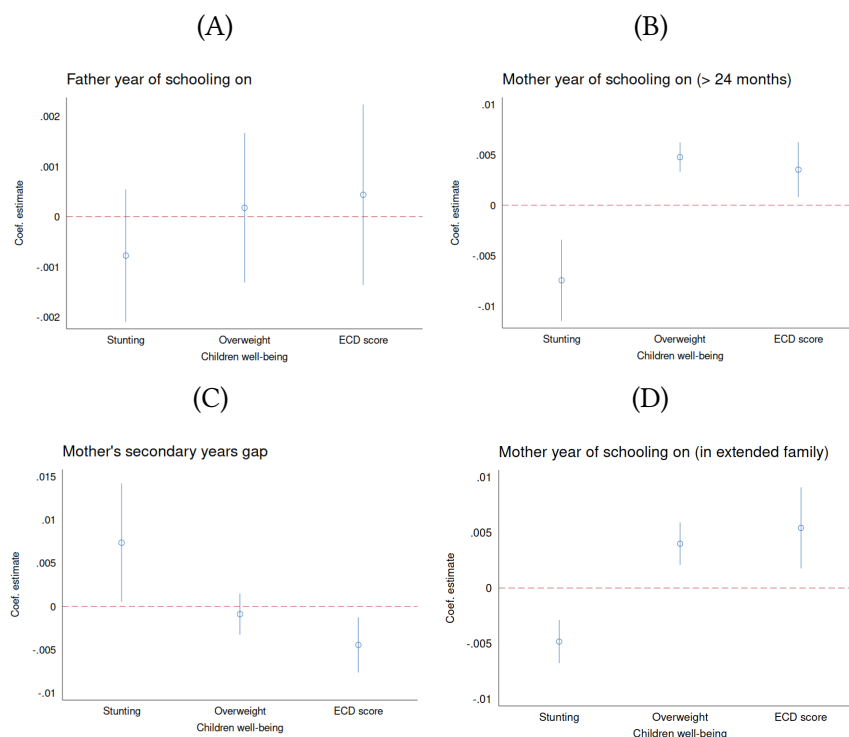
We perform the following sensitivity checks. First, we test if the father’s number of years of schooling also has a significant correlation with children’s well-being outcomes. Following our framework, as our results are arguably driven by care practices performed by the mother, we do not expect the father’s education to affect the children’s well-being significantly. This may serve as an imperfect falsification test for the following reasons. First, the father’s education might be highly correlated with the children’s well-being via assortative matching. A more educated husband is likely to marry a more educated wife. Second, fathers may also affect children’s well-being if they serve as primary carers. However, our data reveal that more than 95% of primary carers are mothers. Our results in Figure [9](#) show that in our case, the father’s number of years of schooling does not have a significant effect but has a similar direction as the mother’s number of years of schooling in regard to children’s well-being.

We perform our second sensitivity check by restricting our sample to only children who were older than 24 months. We test that our main results are not driven by a particular age group of children. Moreover, for some outcomes such as being overweight and stunting, younger children might tend to bias the estimated coefficient downwards. As summarized in Figure [9B](#), we find that our results are robust to alternative sample restriction. Our third sensitivity check relates to our discussion in subsection [5.1](#). If education matters, we should find similar results using another proxy of education. As a large proportion of women in our sample have a secondary education, an alternative measure of education is the gap to completing secondary education. A larger gap represents a greater distance to completing secondary education. To be consistent with our main results, we expect to obtain results that point to the opposite relationship with children’s well-being. The results in Figure [9C](#) confirm our hypothesis. A higher gap to completing secondary education is associated with greater stunting, lower obesity (not significant), and a lower ECDI score.

Lastly, as we mentioned earlier, many households in our sample contain an extended family. One might suspect that maternal education will be less relevant since spillover knowledge and extra care may come from other household members. We find, as depicted in Figure [9D](#), that the results for those living with extended family members mimic our main results in terms of each child’s well-being. The estimated coefficients of the effect of the mother’s number of years of schooling on the children’s well-being remain statistically significant for children

who live in a household with extended family members.

Figure 9: Sensitivity checks



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

7 Conclusion

We study the relationship between maternal education and children's well-being using Pacific countries as a case study. Pacific countries provide a unique motivation to perform this type of study 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 enjoy relatively good access to education; most women have at least a secondary degree. Third, children in Pacific countries have high obesity rates compared to other developing countries.

Using the richness of the MICS dataset, we investigate the role of the number of years of schooling of mothers on children's well-being, as measured by three outcomes: the stunting incidence, overweight incidence, and ECDI score. Overall, we find that the number of years of schooling has a negative correlation with the stunting incidence. On the contrary, it has a positive correlation with the ECDI score and children being overweight. Further analysis shows that this effect varies across countries.

Our heterogeneity analysis provides several intriguing insights. First, we find pieces of

evidence that suggest that maternal education benefits boys and girls proportionately. We do find, however, that given the same level of maternal education, the likelihood of stunted boys is smaller than that of stunted girls, although this result is not statistically significant. Second, in terms of the stunting outcome, children from second-lowest-quintile households benefit the most from more educated mothers compared to the poorest and richest households. As for the overweight and ECDI score outcomes, our results suggest that household wealth does not affect the relationship between maternal education and such outcomes.

We examine further potential mechanisms behind the impact of the number of years of schooling on children's well-being outcomes. We find that providing ECE and better care practices are two important mediating factors that explain the indirect effects of the number of years of schooling. We further find evidence that the number of years of schooling has positive direct effects on stunting, arguably via nutritional knowledge, which is not fully captured by the mediating factors.

Finally, from a policy perspective, improving access to education for the female population has a limited effect in Pacific countries. Our results indicate that disseminating specific maternal and parenting knowledge and improving ECE access for more children are more effective policies when it comes to improving children's well-being in the Pacific.

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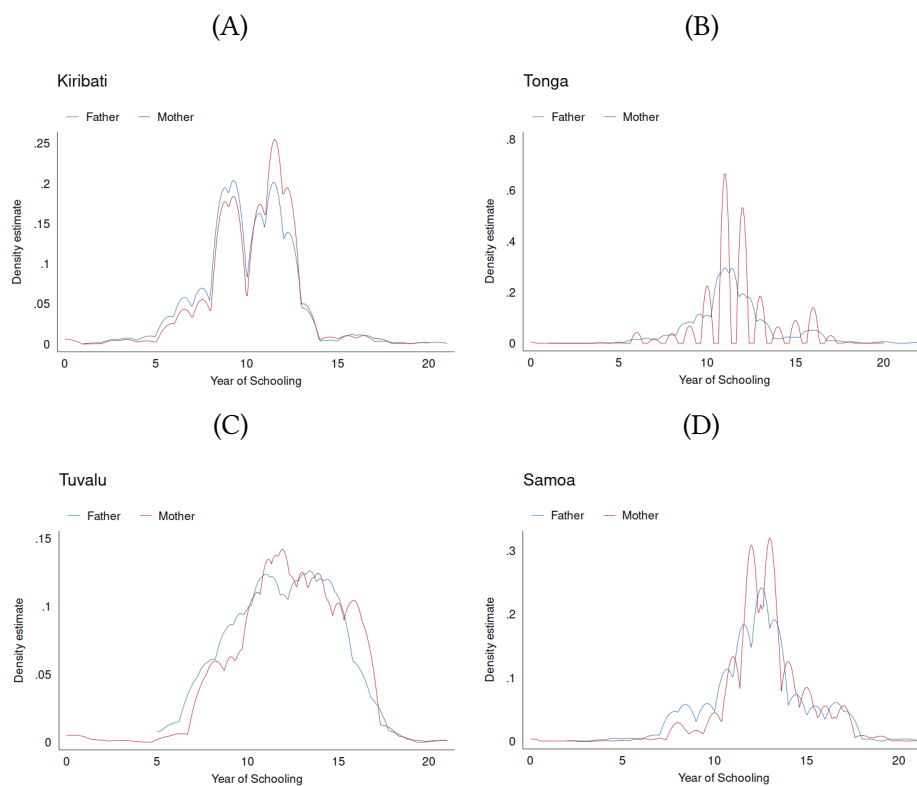
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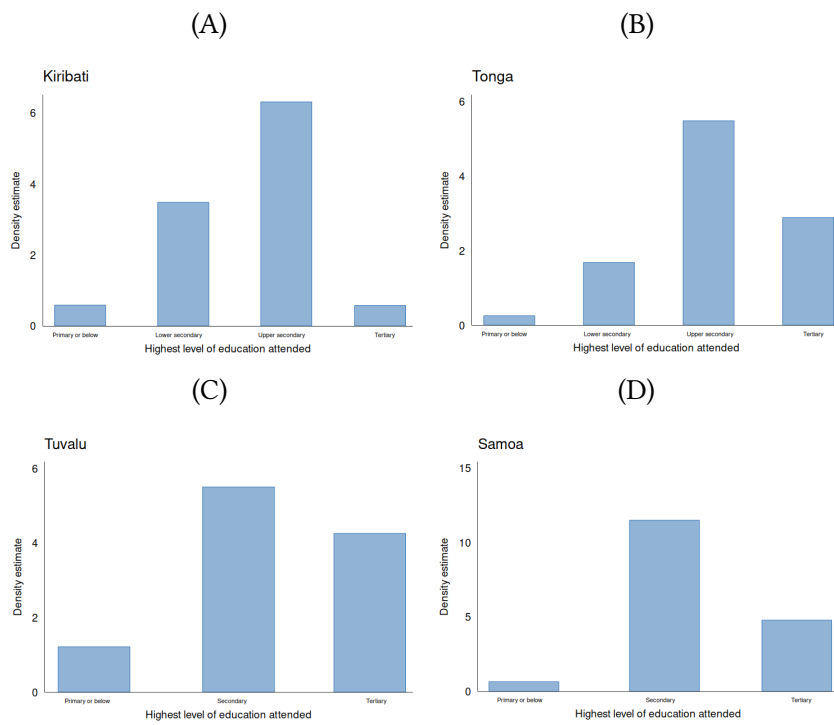
8 Appendix

Figure A1: Density estimate of the number of years of schooling



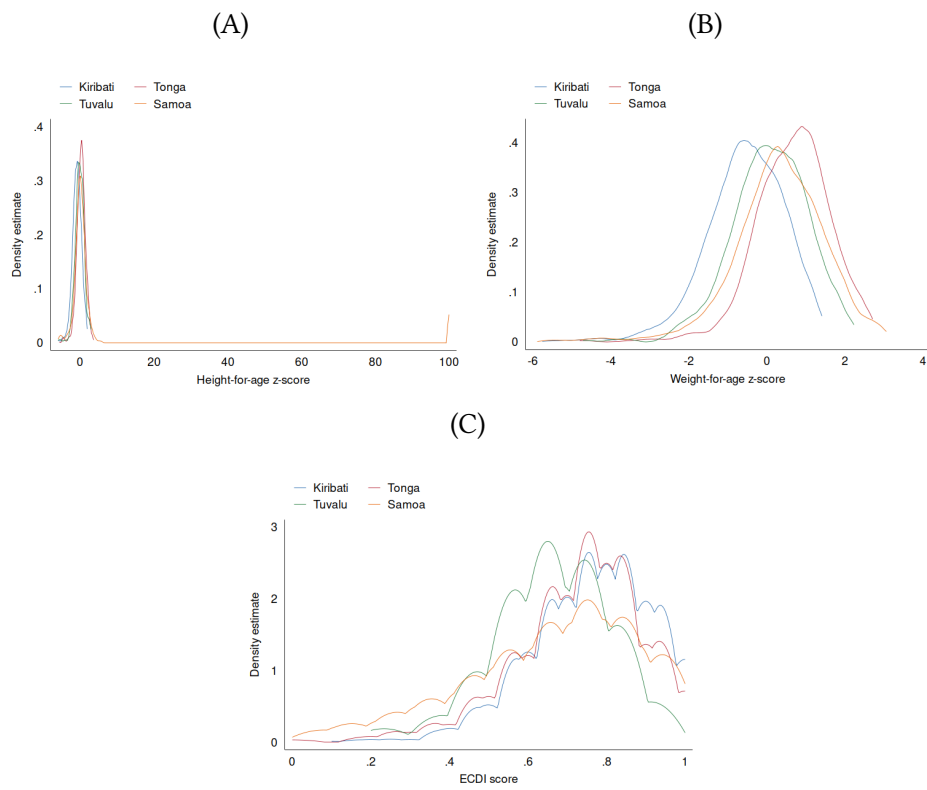
Notes: Estimates were made using the Epanechnikov kernel. The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. The number of years of schooling for the mother and father considers the level of education attended and the actual years completed.

Figure A2: Histogram of highest education level attended



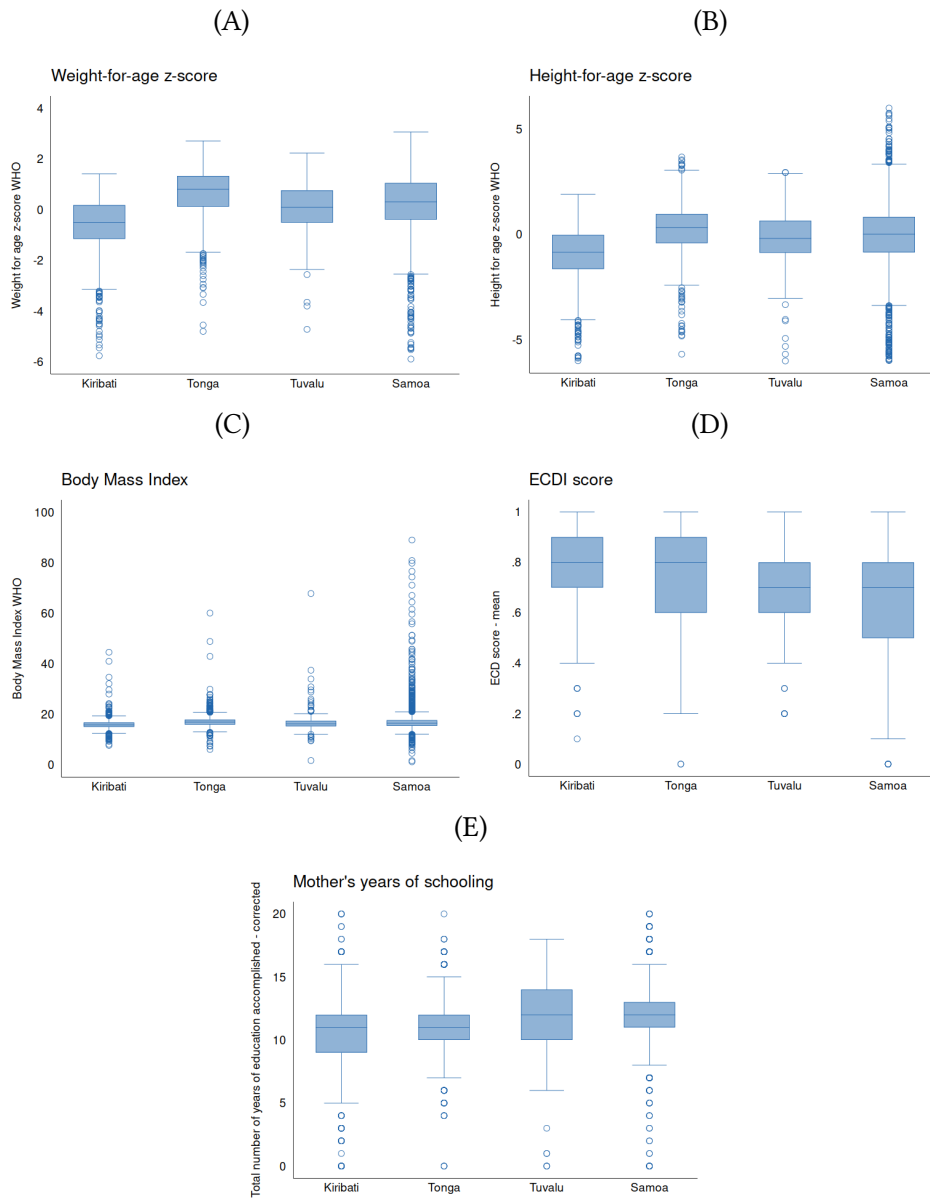
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. For Tuvalu and Samoa, the data do not allow us to divide secondary education into lower and upper secondary education categories.

Figure A3: Density estimate by outcomes and country



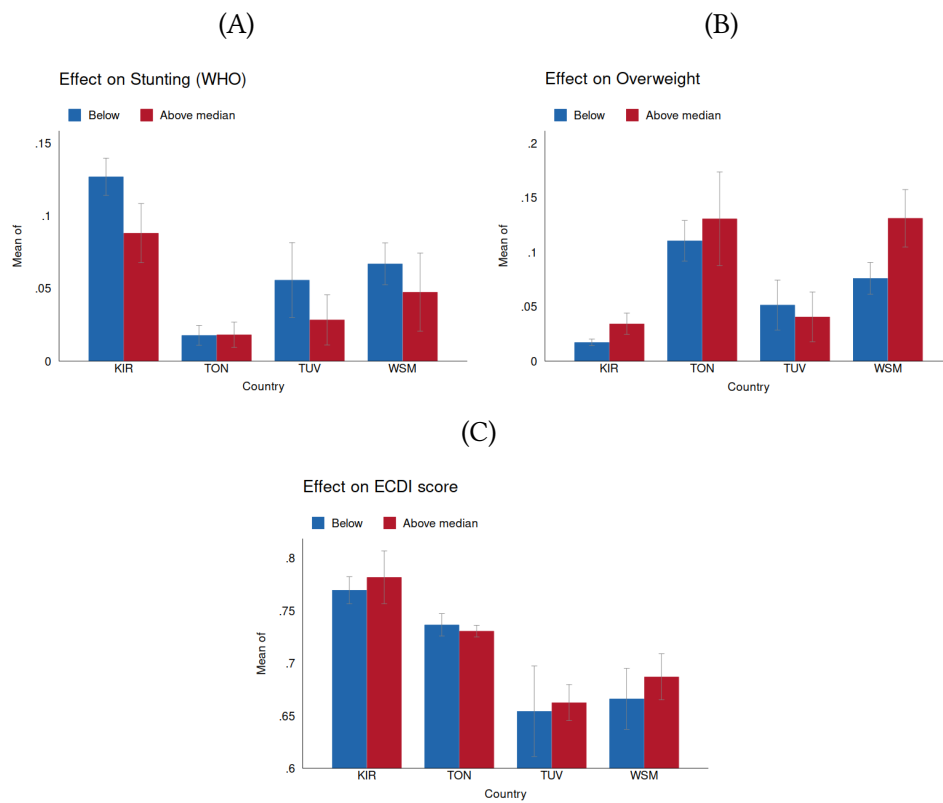
Notes: Estimates were made using the Epanechnikov kernel. The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used.

Figure A4: Distribution across outcomes, by country



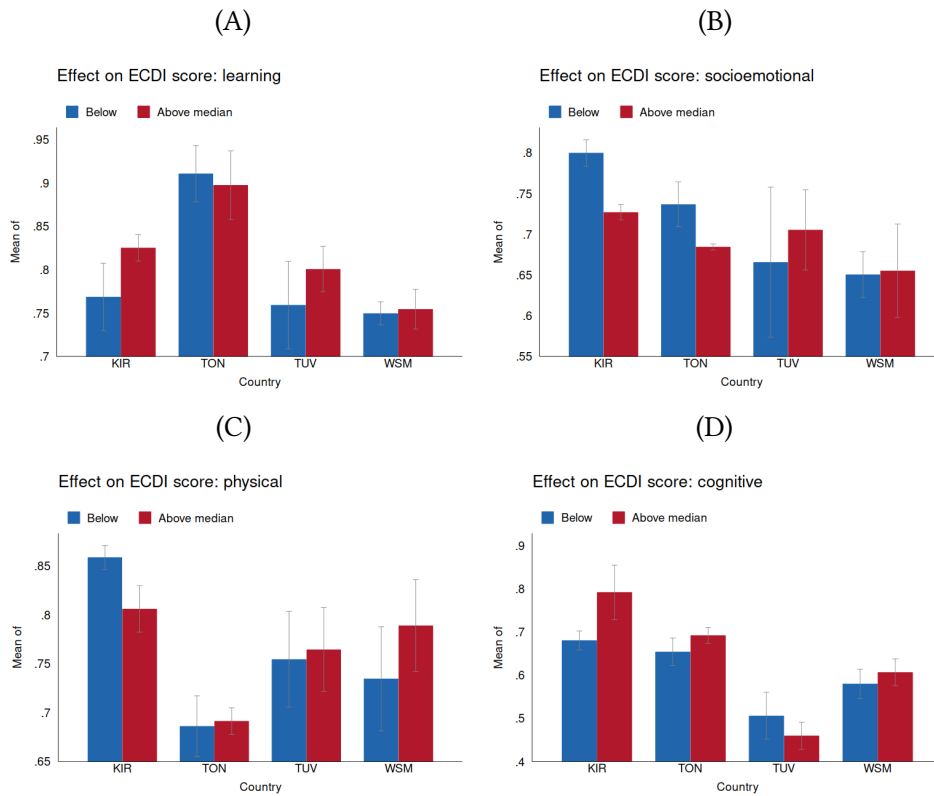
Notes: The results are based on the MICS dataset. This figure plots a box plot of the distribution of outcome variables by country. A sample of 6,174 children who cohabit with their mothers was used. The data were weighted using the individual sample weights provided by the survey.

Figure A5: Maternal education and children's well-being



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Standard errors were clustered at the region level. The plotted standard errors reflect a 90% confidence interval.

Figure A6: Maternal education and ECDI components



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Standard errors were clustered at the region level. The plotted standard errors reflect a 90% confidence interval.

Figure A7: Mediation illustration

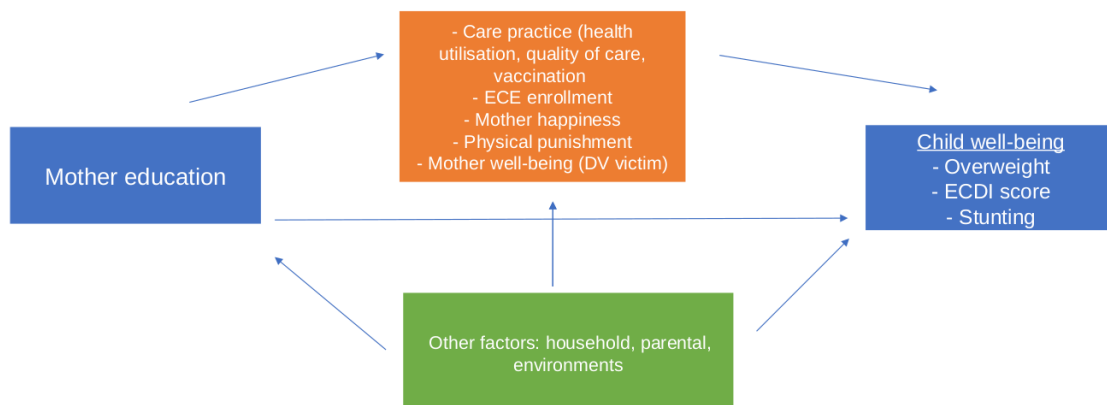
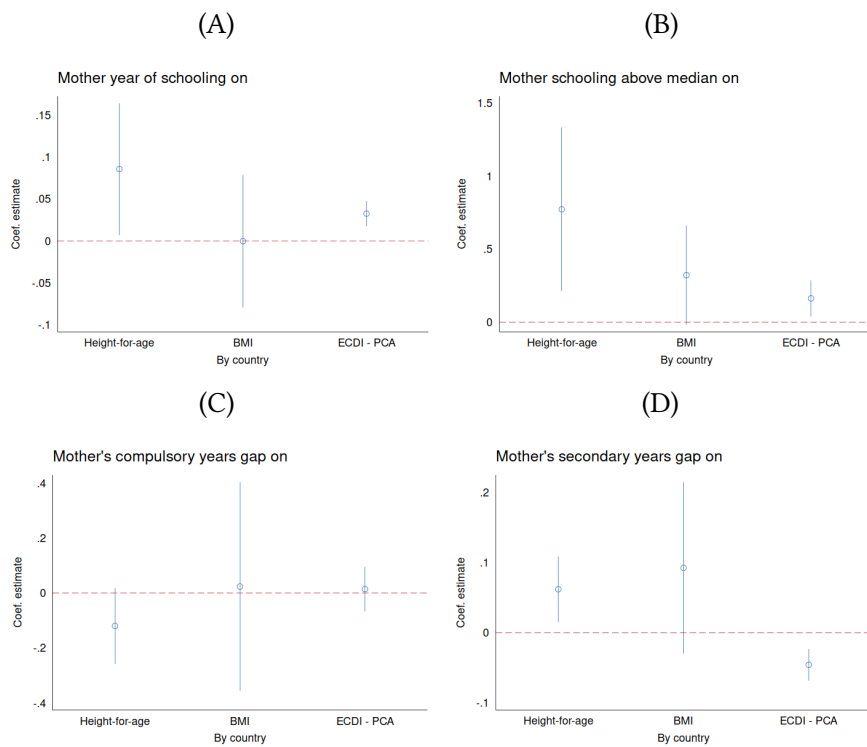
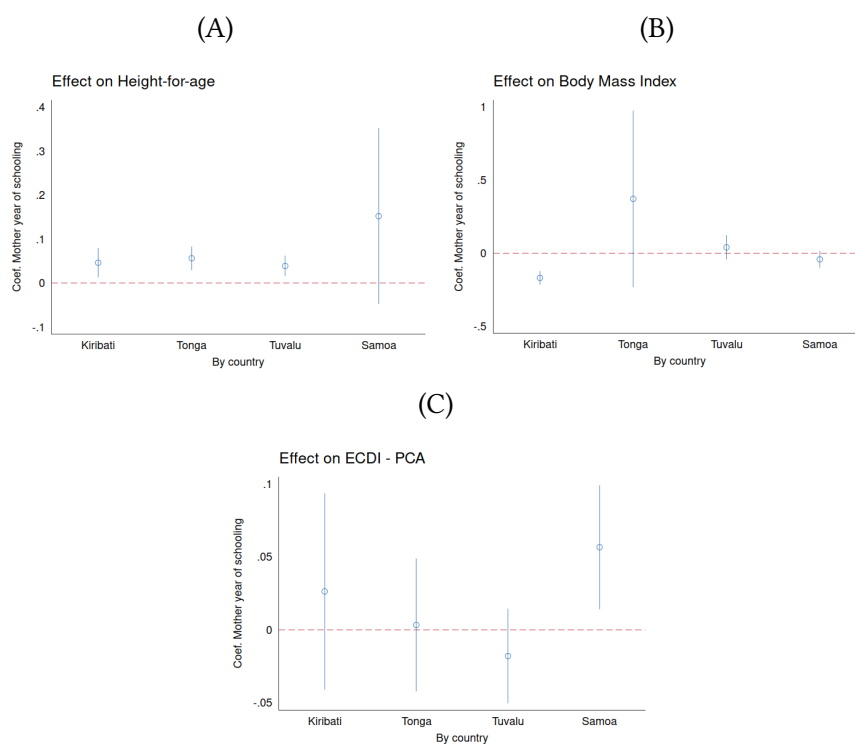


Figure A8: Maternal education proxies and alternative children's well-being outcomes



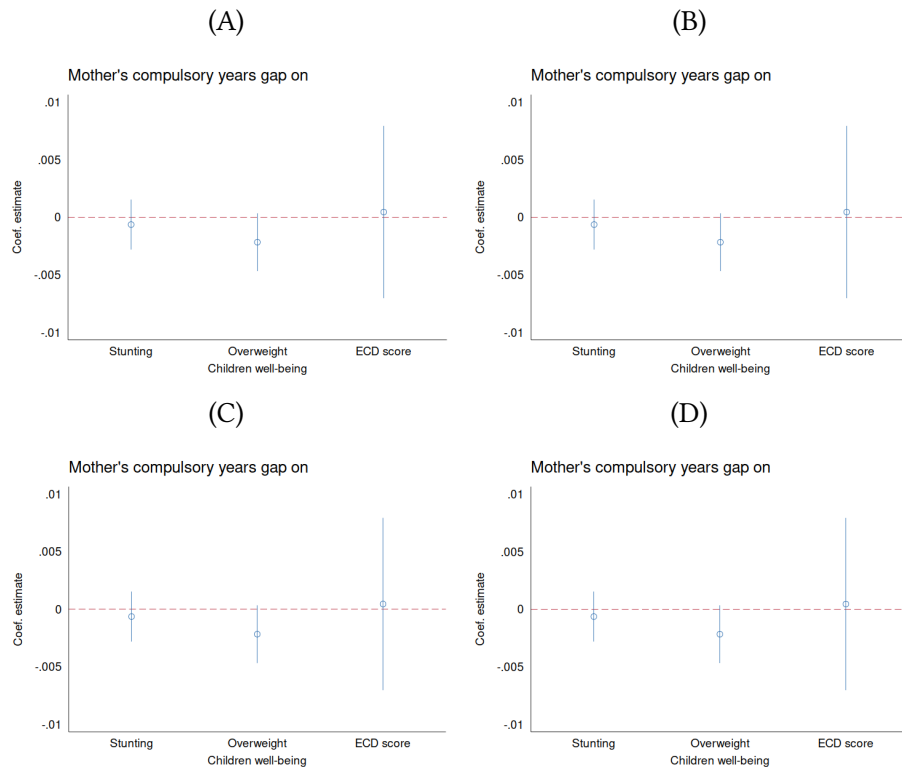
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Figure A9: Maternal education and alternative children's well-being outcomes by country



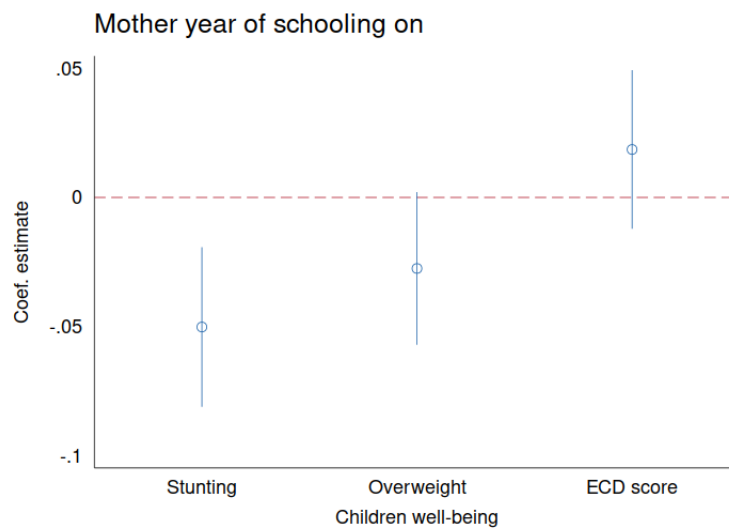
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Figure A10: Maternal education proxies and alternative ECDI score measurements



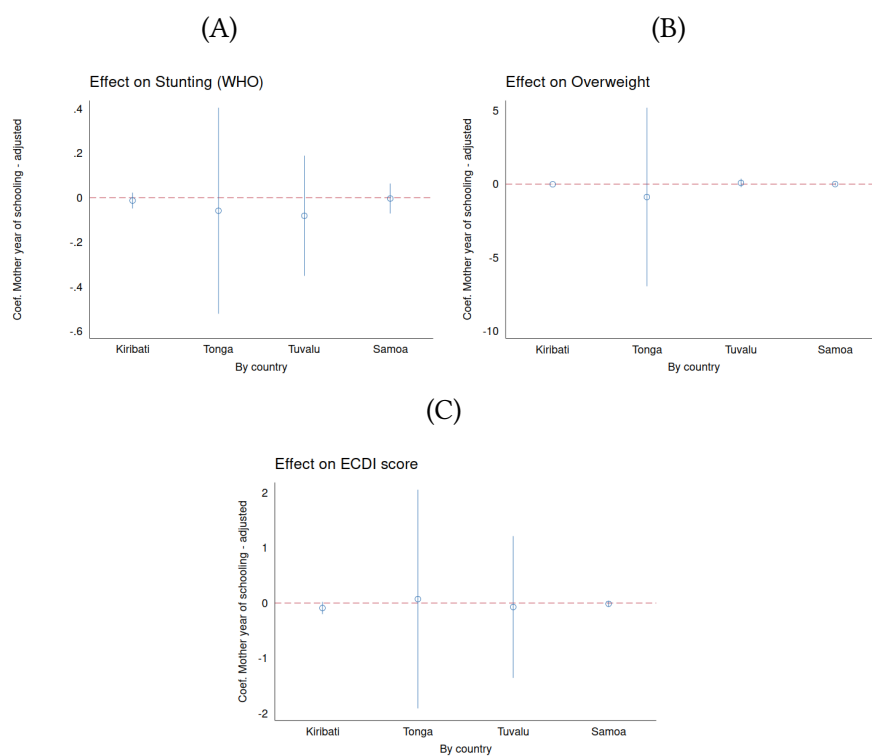
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. The dependent variable is a binary variable that indicates whether the corresponding children are on track for each domain or overall development. To be considered on track for the overall assessment, a child must be on track in at least three domains. To be considered on track for the learning domain, a child must be on track for at least one item. To be considered on track for the physical domain, a child must be on track for at least one item. To be considered on track for the socioemotional domain, a child must be on track for at least two items. To be considered on track for the literacy domain, a child must be on track for at least two items. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Figure A11: Second-stage results: Direct effect of the number of years of schooling on outcomes



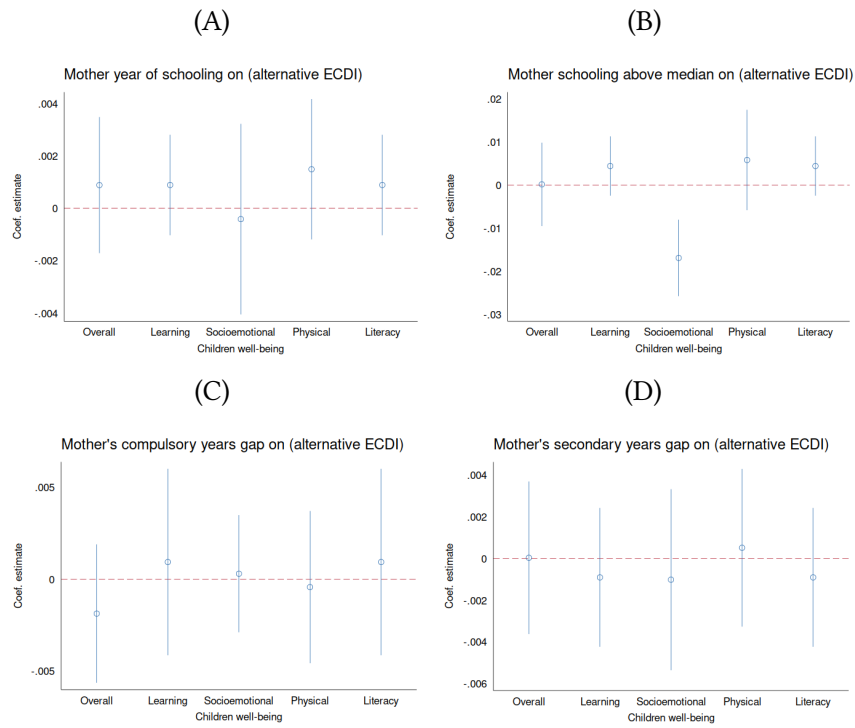
Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. The instrument variable is the leave-one-out mean of the number of years of schooling of the mother's peers. Peer groups are defined based on birth cohort, region of residence, and religion. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the region level. The plotted standard errors reflect a 95% confidence interval.

Figure A12: Maternal education and children's well-being



Notes: The results are based on the MICS dataset.

Figure A13: Maternal education proxies and children's well-being



Notes: The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the regional level. The plotted standard errors reflect a 95% confidence interval.

Table A1: Baseline regression

	(1)	(2)	(3)
	Stunted (=1)	Overweight (=1)	ECDI—overall
	b/se	b/se	b/se
Mother's years of schooling	-0.005*** (0.001)	0.004** (0.001)	0.003** (0.001)
Mother's age	0.000 (0.000)	0.001 (0.001)	0.000 (0.000)
Age of children	0.005 (0.003)	-0.006*** (0.001)	0.072*** (0.009)
Father's age	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Father's years of schooling	-0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Father does not live in HH (=1)	0.027 (0.024)	0.046 (0.024)	0.014 (0.008)
Live in urban area (=1)	0.002 (0.007)	0.025** (0.010)	0.002 (0.008)
Index of household assets	-0.016 (0.017)	0.012 (0.009)	0.030** (0.011)
Live with extended family (=1)	-0.011 (0.007)	-0.000 (0.007)	-0.005 (0.011)
TON	-0.086*** (0.011)	0.088*** (0.014)	-0.049*** (0.007)
TUV	-0.058** (0.016)	0.004 (0.016)	-0.120*** (0.008)
WSM	-0.038*** (0.009)	0.064*** (0.009)	-0.111*** (0.012)
Constant	0.170*** (0.023)	-0.062** (0.019)	0.445*** (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 SE	Regions	Regions	Regions

* p<0.05, ** p<0.01, *** p<0.001. Standard errors are given in round parentheses. The results are based on the MICS dataset. A sample of 6,174 children who cohabit with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the region level.

Table A2: Mediating variable regression

	(1)	(2)	(3)
	Stunting (=1)	Overweight (=1)	ECDI score
	b/se	b/se	b/se
Mother's care score	-0.006* (0.003)	-0.001 (0.001)	0.007** (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 SE	Regions	Regions	Regions
	b/se	b/se	b/se
Mother's happiness	0.001 (0.005)	-0.005 (0.004)	-0.007 (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 SE	Regions	Regions	Regions
	b/se	b/se	b/se
Mother experiences DV	0.005 (0.003)	-0.002 (0.005)	0.002 (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 SE	Regions	Regions	Regions
	b/se	b/se	b/se
Children experience abuse	-0.000 (0.002)	-0.004* (0.002)	0.009*** (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 SE	Regions	Regions	Regions
	b/se	b/se	b/se
Mother provides ECE	-0.011 (0.008)	0.018* (0.009)	0.066*** (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 SE	Regions	Regions	Regions

* p<0.05, ** p<0.01, *** p<0.001. Standard errors are given in round parentheses. The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the region level.

Table A3: IV regression

<i>Panel A. Second stage</i>	(1)	(2)	(3)
	Stunted (=1)	Overweight (=1)	ECDI—overall
	b/se/t	b/se/t	b/se/t
Mother's YOS	-0.050*** (0.019) [-2.671]	-0.028 (0.018) [-1.530]	0.019 (0.019) [0.995]
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	0.072	0.071	0.715
Covariates	Yes	Yes	Yes
Sample	All children	All children	All children
Clustered SE	Robust	Robust	Robust
<i>Panel B. Reduced form</i>	Stunted (=1)	Overweight (=1)	ECDI—overall
	b/se/t	b/se/t	b/se/t
Mother's peers' YOS	-0.011*** (0.004) [-2.898]	-0.006 (0.004) [-1.600]	0.005 (0.005) [0.999]
<i>Panel C. First stage</i>	Mother's YOS	Mother's YOS	Mother's YOS
	b/se/t	b/se/t	b/se/t
Mother's peers' YOS	0.211*** (0.035) [5.991]	0.208*** (0.035) [5.904]	0.252*** (0.059) [4.254]
Observations	6384	6346	2631

* p<0.05, ** p<0.01, *** p<0.001. Standard errors are given in round parentheses. t-statistics are given in brackets. The results are based on the MICS dataset. The instrument variable is the mother's peers' number of years of schooling. Peer groups are defined as sharing the same five-year birth cohort group, gender, region of residence, and country of residence. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the region level.

Table A4: 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
Mother's years of schooling	0.005*** (0.001)	-0.005*** (0.001)	0.002 (0.001)	0.000 (0.002)	0.001 (0.004)	0.001 (0.001)
Mother provides high-quality care	0.003 (0.005)	-0.016 (0.009)	0.033** (0.009)	0.037* (0.015)	0.003 (0.005)	0.022** (0.008)
Mother provides ECE	0.013 (0.010)	-0.012 (0.008)	0.063*** (0.012)	0.052*** (0.014)	0.019 (0.012)	0.024 (0.016)
Mother's happiness	-0.008 (0.004)	0.004 (0.004)	-0.007 (0.011)	-0.009 (0.023)	-0.009 (0.021)	-0.020 (0.019)
Mother experiences DV	-0.004 (0.005)	0.002 (0.003)	-0.002 (0.007)	0.001 (0.013)	-0.007 (0.012)	0.020 (0.011)
Children experience abuse	-0.004 (0.002)	-0.001 (0.002)	0.011*** (0.002)	0.007 (0.004)	0.033*** (0.003)	0.008** (0.003)
R2	0.030	0.024	0.127	0.055	0.079	0.055
Mean	0.071	0.072	0.715	0.797	0.705	0.762
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All children	All children	All children	All children	All children	All children
Clustered SE	Regions	Regions	Regions	Regions	Regions	Regions

* p<0.05, ** p<0.01, *** p<0.001. Standard errors are given in round parentheses. The results are based on the MICS dataset. A sample of 6,174 children who cohabitate with their mothers was used. Covariates include the children's age, mother's age, father's age, father's years of schooling, dummy variables for living in an urban area and living with extended family, household asset index, and an indicator of whether the father lived in the household at the time of the interview. Standard errors were clustered at the region level.