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Child Well-being and Economic Growth: A Cross Country Analysis

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Abstract

This study investigates the relationship between various indicators of child well-being and economic growth. It groups indicators of child well-being into four key dimensions, namely child health, child education, child nutrition, and child access to water and sanitation. The study uses panel data of 5-year averages for 184 developed and under-developing countries for the period 1960-2020. It employs the mediation/ moderation analysis to examine the conditional direct and indirect effects of our composite measures of child well-being on growth. For estimation, we use the seemingly unrelated regression method for unbalanced panel data as developed by Biorn (2004). Our results show that child health, nutrition and education have a positive impact on economic growth. However, the direct impact of child access to water and sanitation is negative which is conditional on the levels of child health. The findings of this study can help policymakers to understand the role of different aspects of child well-being in building a solid foundation for more equitable and sustainable economic growth in the future.

Key Words: Child well-being; Economic growth; Child health; Child education: Child access to water and sanitation; Child nutrition

JEL Codes: I15, I31, I25, O40

1 Introduction

The determinants of economic growth gained a lot of attention in applied and theoretical research. However, there is still no adequate conceptualization of the process behind economic growth (Sloboda & Sissoko, 2020). There is a lack of unifying or generalized theory about determinants of economic

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growth, but despite this lack, there are several partial theories that attempt to define the process, and leading factors behind it (Barro & Sala-i-Martin, 1995; Kawalec, 2020). These theories divide the determinants of economic growth into two main categories, proximate and fundamental sources of economic growth. Most of the past literature on growth considers the proximate measures of labor, capital, and technology as the major determinants of economic growth (Solow, 1956; Romer, 1986; Lucas, 1988). However, the later studies incorporate the effects of institutions, geography, demography, and sociocultural factors in their analysis of economic growth (Krugman, 1991; Easterly & Levine, 2003; Oshodi, 2018).

The impact of children's well-being on economic growth is ignored by economic growth models and theories. Child well-being can be defined as the availability of resources and the presence of conditions that are required for reasonably secure, comfortable, and healthy living for children. Child well-being is associated with lower illness load, enhanced marginal productivity and skills, and access to higher wages (Psacharopoulos & Patrinos, 2002; Hanushek & Woessmann, 2012; Davenport et al., 2017). There are several channels, which may fall into four main categories, through which child health may affect economic growth; namely improved productivity, enhanced educational outcomes, propelled investment in physical capital, and demographic dividend. The healthy populations have extra motivation to devote to education, as they expect to live longer and want to reap the benefits of their investment over a longer period of life. Furthermore, due to higher life expectancy, the present value of human capital is higher. Furthermore, better health generates a demographic dividend. A decrease in infant and child mortality decreases fertility, the initial increase in the young population of any economy gradually increases the proportion of the working population, and this cycle ends up with a high level of GDP per capita. Studies show that this cycle may be responsible for an almost 0.3% to 1.3% increase in annual GDP growth for Asian countries over the period 1965-1990 (Asian Development Bank, 1997; Bloom et al., 2004).

In addition to child health, better child nutrition enhances productivity, learning abilities, and life expectancy; thus, providing benefits at both micro and macro levels. Well-nourished children have increased abilities to learn (Nie et al. 2019). Improved water and sanitation facilities affect economic growth by reducing illness and mortality in children. It also improves academic skills through higher cognitive abilities and low absentees in school. The value of time saved due to closer access to water and sanitation is worth $64 billion globally (Hutton & Haller; 2004). Improved water and sanitation also have some physiological impacts, like the feeling of privacy and cleanness, and well-being which positively affect human behavior, productivity, and economic growth (Bekele et al., 2020). Further, awareness about the benefits and importance of an improved water and sanitation system leads to a higher degree of cleanness, which provides a good environment in a country and promotes tourism, generating a positive impact on the process of economic growth. Moreover, good quality education increases the cognitive abilities of individuals; educated people can easily cognize and develop new technologies which in turn increases growth (Benhabib & Spiegel, 1994). Education has spillover effects on educated people as they learn from each other and make education a public good. Educated societies can generate better skills and ideas, which ultimately enhance productivity and economic growth (Lu, 2020).

A vast literature is available on investment in children and economic growth, however, there is limited literature that addresses child well-being as a determinant of economic growth. Moreover, studies on child well-being focus only on one or two dimensions and do not recognize different dimensions of child well-being together as important determinants of economic growth. Psacharopoulos and Patrinos (2002) and Hanif and Arshed (2016) incorporate the impact of child education on economic growth. However, other studies (Horton & Ross, 2003; Wang & Taniguchi, 2003; Vollmer et al., 2014) focus on child nutrition and economic growth. Moreover, some studies such as Grimm (2010) and Hutton and Haller (2004) focus on child health and economic growth and child access to improved water and sanitation sources and economic growth respectively. No well-known study has been conducted to examine how different dimensions related to child-wellbeing together interact in determining long-term economic growth. This study fills in this gap and focuses on four key dimensions of child well-being.

Furthermore, most of the previous studies when addressing any dimension of child well-being used only one or two indicators as a proxy for these dimensions. In the case of child health, studies (Barro & Lee, 1994; Caselli et al., 1998) use life expectancy as a proxy of child health. Whereas some other studies (Grimm, 2010; Amiri & Gerdtham 2013) use child or infant mortality as a proxy for child health. There are very limited studies that examine the impact of any dimension of child well-being on economic growth with a comprehensive view. Further, an important contribution of this study, is the construction and usage of composite measures of child health, education, nutrition, and access to improved water and sanitation in the analysis of economic growth. Moreover, it uses moderated mediation analysis to study the direct and conditional indirect impacts of these indicators on economic growth.

2 Literature Review

Child well-being affects economic growth by providing a positive change in child health, nutrition, access to water and sanitation, and education.

The positive correlation between health and per capita GDP is one of the recognized relationships in international economic development (Rees et al., 2012). Studies have shown that the impact of health on growth is more dominant than the impact of growth on health (Bloom et al., 2004; Weil, 2007, Davenport et al., 2017). For example, Barro and Lee (1994) examine the relationship between economic health and growth for the period 1975-1985 and conclude that a 1% increase in life expectancy increases GDP growth by 0.58%. Furthermore, Laxminarayan et al. (2006) document that immunization interventions for children are the most cost-effective intervention to improve health. Furthermore, Amiri and Gerdtham (2013) examine the relationship between the child and maternal mortality on economic growth. However, other studies like Lindahl and Krueger (2001) find little or no fundamental relationship between child health and economic growth. Moreover, Acemoglu and Johnson (2007) find a negative relationship. Their findings suggest that upgraded life expectancy may cause an increase in population growth that may diminish the effect of higher per capita GDP.

When it comes to nutrition, access to good nutrition is considered a basic human right, and an investment in human capital. Arcand (2001) investigates the impact of undernutrition on economic growth and documents a mechanism through which it impacts economic growth. He uses panel data of 110 developed and underdeveloped countries over the period 1960-1990 to conclude that the average growth rate of GDP of countries that have less food scarcity is three times higher than countries that have more food scarcity. While inadequate nutrition decreases the annual growth of a country by 0.23 % to 4.7%. Similarly, Wang and Taniguchi (2003) examine the short and long-run impacts of nutrition on per capita GDP growth using 5- and 10-years averages of 114 countries. They conclude that an increase in nutritional status enhances the economic growth rate permanently, and the short-run effect will be greater than the long-run effect. Similarly, Nie et al. (2019) find a significant correlation between child nutrition and the economic condition of children in India.

Recently, improved water and sanitation gained a lot of importance as a determinant of the growth process, which otherwise remained neglected for a longer period. Improved water and sanitation impact economic growth by reducing illness and mortality in children. It also accelerates the process of economic growth by increasing labor productivity and academic skills through higher cognitive abilities and low absentees in schools (Bekele et al., 2020). The value of time saved due to closer access to water and sanitation is worth $64 billion globally (Hutton & Haller, 2004). However, few studies examine the economic impacts of improved water and sanitation. For example, Hutton and Haller (2004) aim to investigate the economic impacts of improved water and sanitation. Their results show that, in developing countries, interventions to provide easy access to water and sanitation benefit up to US$28 for each US$ invested in it. However, the study of Whittington et al. (2008) finds opposite results that the infrastructure of water and sanitation set-up has a higher benefit-cost ratio, depending on certain assumptions benefits are less than costs.

There have been several studies to quantify the relationship between education and economic growth. For example, Psacharopoulos and Patrinos (2002) examine the relationship between education and economic growth and show that every additional year of schooling increases future earnings by 10%. In the context of Pakistan, Khattak and Khan (2012) use data over the period 1971-2008 and show that secondary education positively and significantly affects economic growth. In reference to public policy, Lu (2020) finds that government policies on child education can increase the well-being of children and their families, and if these policies are for a significantly long period they can result in economic growth. However, some studies like Pritchett (2001) find no significant impact of schooling years on economic growth.

3 Methodology and Data Source

This study uses four different components or dimensions of child well-being based on eleven child welfare indicators.

Child welfare indicators that are related to health care are[3] child mortality (cm), immunization against diphtheria, pertussis, and tetanus (immdpt), immunization against measles (immes), and life expectancy at birth (le). cm is the most important and dominant indicator of child health (Cheng et al., 2012; Amiri & Gerdtham, 2013). It is also included in Millennium Development Goals (hereafter MDG)[4].immdpt and immes are the central part of child health (Laxminarayan et al., 2006), and can prevent diseases in 24 million children in a year. In the year 2012, 6.6 million children died mainly due to reasons that can be eliminated with proper vaccinations. Whereas life expectancy at birth (le) is also used in many studies as a proxy for health status (Barro & Lee, 1994; Bloom et al., 2004).

Child welfare indicators that are related to education are net enrolment in primary school (nep), net enrolment in secondary school (nes), and primary school completion rate (pscr). Net primary and secondary enrolments are used generally as indicators of child education level (Psacharopoulos & Patrinos, 2002; Khattak & Khan, 2012). Primary school graduation is also an

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[3] There are also other measures of child health like the presence of headaches, food and digestive allergies, asthma, and respiratory allergies, but this study focuses on the four most important indicators, mainly due to the problem of data availability.

[4] MDG 4: Reduce the mortality rate of children under 5 years old (under-5 mortality) by two-thirds between 1990 and 2015.

important indicator of child education level, and it is included in MDG[5].

Child welfare indicators that are related to nutrition are[6] malnutrition weight for age (mwa) (for children under 5) and malnutrition height for age (mha) (for children under 5). Child welfare indicators that are related to water and sanitation are the proportion of children with access to water/ improved water (imw) and the proportion of children with access to sanitation/ improved sanitation (ims), and they are included in MDG[7].

This study also uses some of the most commonly and widely used determinants of economic growth as control variables in its econometric model specifications. These variables include investment (inv), human capital (hc), government spending (gov), inflation (inf), and openness of trade (open). We measure economic growth (growth) by logging the difference in real per capita GDP (percentages). Further, the study uses panel data of five-year averages of 185 developed and underdeveloped countries over the period of 1960 to 2020. We use five-year averages to control for business cycle effects. We use all the variables in natural log form except the variables which are given in percentages.

3.1 Construction of Child's Well-being Indexes

To convert the correlated indicators into linearly uncorrelated indicators, we use a statistical method of Principal Component Analysis (PCA). Table 5 in the Appendix shows the results for child health PCA using four indicators of child health, namely cm, immdpt, immes, and le. We use the factor loadings of that component for which the Eigenvalue is at least 1.0. Our results show that only the first component analysis is relevant, therefore, our composite measure of child health (healpca) is constructed using the factor loadings of component 1. Similarly, the other three composite measures of child education (edupca;

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[5] MDG 2: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

[6] There are also other measures of child nutrition status like exclusive breastfeeding, Iodine deficiency, Vitamin A supplementation, iron deficiency, and anemia but this study focuses on the two most important and commonly used indicators mainly due to the problem of data availability.

[7] MDG 7-C: Halve the proportion of the population without access to water and sanitation by 2015.

based on nep, nes and pscr), child nutrition (nutpca; based on mha and mwa) and access to water and sanitation (wspca; based on imw and ims) have been constructed using the same methodology. The PCA results of edupca, nutpca and wspca indexes are given in Tables 6 through 8 in Appendix.

3.2 Methodology

To investigate the direct and conditional indirect effects of child well-being measures on economic growth, we construct our econometric model (system of two equations) as follows:

$$healpca_{it} = \gamma_0 + \gamma_1 nutpca_{it} + \gamma_2 wspca_{it} + \varepsilon_1 \quad (1)$$

$$growth_{it} = \alpha + \beta_1 y_{0it} + \beta_2 hc_{it} + \beta_3 nutpca_{it} + \beta_4 wspca_{it} + \beta_5 healpca_{it} + \beta_6 (healpca_{it} * nutpca_{it}) + \beta_7 (healpca_{it} * wspca_{it}) + \acute{\beta}_8 Z + \varepsilon_2 \quad (2)$$

Where, healpca is a log of child health, nutpca is a log of child nutrition, wspca is a log of child water and sanitation, growth is real per capita GDP growth, y0 is log of initial per capita GDP, hc is a log of the human capital measured by average years of schooling, healpca*nutpca is interaction term of child health and nutrition, healpca*wspca is interaction term of child health and water and sanitation, Z is a vector of control variables, such as gov, inf, open, and inv. Ɛ1 and Ɛ2 are stochastic error terms. i and t subscripts are countries and time period respectively.

The above model does not include child education measure (edupca) due to two main reasons. First, to avoid the problem of multicollinearity, as child education measure is highly correlated with almost all other determinants of economic growth (as shown in Table 9 in Appendix). Second, the variable human capital (hc) incorporates the aspects of child education, where the average year of education attainment by age group 15 and over is used as a proxy of human capital.

The above model comprises two equations. Equation 1 is the mediation equation, whereas equation 2 shows the interactive effects of health indicators on economic growth. We use these two equations simultaneously to estimate the direct and conditional indirect effects of health indicators on economic growth following Muller et al. (2005), Preacher et al. (2007), and Hayes (2013). Specifically, we investigate the direct effects of child nutrition (nutpca) and child water and sanitation (wspca) on economic growth as well as the indirect effects of these measures on economic growth through the channel of child health (healpca).

Moreover, we use healpca as a moderator, thus focusing on the conditional indirect effects of nutpca and wspca on economic growth.

The most frequently used procedures for panel data analysis are the one-way or two-way random effect (RE) and fixed effect (FE) models. However, the econometric methods available for the estimation of a system of equations for unbalanced panel data are relatively new. Biørn (2004) develops a procedure for the estimation of a one-way Seemingly Unrelated Regression (SUR) system with random effects (RE). Monte Carlo simulations show that SUR techniques are superior compared to the standard single equation FE and RE estimators. Therefore, we estimate equations (1) and (2) simultaneously using SUR with one-way random effects (RE) as suggested by Biørn (2004).

This procedure has several advantages, for example, it is possible to control country-level heterogeneity to avoid biased estimates. Furthermore, due to time and cross-country dimensions, there is more information, less collinearity, and greater efficiency in the estimates (Latif et al., 2017; Biørn, 2004; Baltagi, 2005).

We calculate the direct and indirect effects from equations (1) and (2) as follows:

Conditional Direct Effects of nutpca and wspca on growth

$$\frac{\partial growth}{\partial nutpca} = \beta_3 + \beta_6 healpca \tag{3}$$

$$\frac{\partial growth}{\partial wspca} = \beta_4 + \beta_7 healpca \tag{4}$$

Conditional Indirect Effects of nutpca on growth

$$\frac{\partial growth}{\partial nutpca} = \frac{\partial healpca}{\partial nutpca} * \frac{\partial growth}{\partial healpca} \tag{5}$$

$$\frac{\partial growth}{\partial nutpca} = \gamma_1(\beta_5 + \beta_6 lnutpca_{it} + \beta_7 lwspca_{it}) \tag{6}$$

Conditional Indirect Effects of wspca on growth

$$\frac{\partial growth}{\partial wspca} = \frac{\partial healpca}{\partial wspca} * \frac{\partial growth}{\partial healpca} \tag{7}$$

$$\frac{\partial growth}{\partial wspca} = \gamma_2(\beta_5 + \beta_6 lnutpca_{it} + \beta_7 lwspca_{it}) \tag{8}$$

4 Results and Discussion

This section explains the empirical results of our analysis of child welfare indicators and economic growth. We estimate our baseline models (without control variables) and final models (with control variables) using the seemingly unrelated regression method for unbalanced panel data as suggested by Biorn (2004). Models (1) and (2) in Table 1 show results from the estimation of baseline and final models respectively.

The marginal impact of nutpca on growth in both models is positive and statistically significant at 1% level. It shows that improved child nutrition increases child learning and productive abilities which increases children's future income and long-run economic growth as a 1% increase in child nutrition increases the economic growth by 0.3%[8]. However, we observe a smaller coefficient of nutpca in the model (2) that may be due to including other important determinants of economic growth. Our results are consistent with the empirical findings of Arcand (2001) and Wang and Tanignchi (2003). We also observe the conditional impact of nutpca on growth through the interaction term of nutpca and healpca (nutpca*healpca). The conditional impact of nutpca on economic growth is negative with a coefficient of 5.69 in model (1) and a coefficient of 2.82 in the model (2) results being significant at 1% in both models. Our results of conditional effects show that nutpca and healpca are substitutes to each other in generating economic growth. Furthermore, the positive impact of nutpca on growth diminishes as the level of child health (healpca) increases. Likewise, the positive impact of nutpca on growth is stronger for countries where healpca is low, and it is weaker in countries where healpca is high.

Moreover, Table 1 shows that child water and sanitation (wspca) has a positive and significant impact, at 1% level, on child health (healpca) in models (1) and (2).Our results show that an improvement in water and sanitation sources (wspca) increases healpca by reducing diseases and mortality in children. These results are consistent with the results of Cheng et al. (2012). However, the marginal impact of wspca on economic growth is negative and statistically significant at a 1% level, which is consistent with Whittington et al. (2008) and conclude that water and sanitation infrastructures have cost more than the benefits. The conditional impact of wspca on growth can be observed through an interaction term between wspca and healpca

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[8] As the independent variable (*nutpca*) is in log form, while the dependent variable (*growth*) is in percentages, so we divide the coefficient by 100 to make the interpretation meaningful.

(wspca*healpca). The interaction has a positive coefficient of 5.88 in model (1) and 2.562 in model (2), which are significant at a 1% level. It shows that an improvement in healpca diminishes the negative impact of wspca on growth.

Table: 1

Variables	Model (1) Baseline Model		Model (2) Final Model	
	healpca	***growth***	***healpca***	**growth**
nutpca	0.0472	30.9183***	0.0888	15.0485***
wspca	1.1094***	-34.9811***	1.1002***	-14.8805***
yo		-0.0001***		-0.0001***
hc		0.4100***		1.1734***
healpca		2.9277***		1.3595***
*nutpca*healpca*		-5.6929***		-2.8210***
*wspca*healpca*		5.8896***		2.5628***
Control variables				
inv				1.1181***
inf				-1.1703***
open				1.1918***
gov				-2.7645***

Impact of Child Well-being on Economic Growth

Source: Author's Calculations

Note: ***, **, * denote 1%, 5% and 10% levels of significance using p-values.

In table 1 healpca and growth are dependent variables in models (1) and (2). nutpca is child nutrition, wspca is child water and sanitation, yo is initial real per capita GDP, hc is human capital, healpca is child health, nutpca*healpca and wspca*healpca are interaction terms, inv is investment to GDP ratio in percent, inf is inflation rate measured as percent change in CPI, open is exports plus imports to GDP ratio in percent, and gov is government final consumption expenditures percent of GDP.

All the variables are used in the log form except inf and growth. The estimated coefficients of the mediation equation (1) are shown in the first column, while the interactive effects are shown in the second column of each model.

Table:2

Conditional Indirect Effects of Child's Well-being on Economic Growth

Variables	Levels of Impact	Conditional Indirect Effects	95% Confidence Interval	
Child Nutrition (*nutpca*)	Low	0.6201 (0.751)	-3.208	4.4492
	Average	0.5277 (0.751)	-2.7310	3.7865

	High	0.4354 (0.751)	-2.2530	3.1238
Child Water & Sanitation (*wspca*)	Low	14.5480*** (0.000)	11.478 2	17.618 4
	Average	12.3810*** (0.000)	9.7657	14.997 0
	High	10.2140*** (0.000)	8.0523	12.376

Source: Author's Calculations
Note: p-values are given in parentheses. ***, **, * show significance at 1%, 5% and 10% levels respectively.

In table 2 child health is taken as mediator/ moderator using baseline model of Table 1. A low level of impact implies an average minus one standard deviation of nutpca and wspca respectively. A high level of impact implies an average plus one standard deviation of nutpca and wspca respectively. Whereas average level impact implies an average of nutpca and wspca.

Table 3 shows results where child health is taken as mediator/ moderator using final model of Table 1.

Table: 3
Conditional Indirect Effects of Child's Well-being on Economic Growth

Variables	Levels of Impact	Conditional Indirect Effects	95% Conf. Interval	
Child Nutrition (*nutpca*)	Low	0.4362 (0.503)	-0.839	1.711
	Average	0.3375 (0.503)	-0.649	1.324
	High	0.2388 (0.503)	-0.460	0.937
Child Water & Sanitation (*wspca*)	Low	2.957*** (0.000)	2.277	3.637
	Average	5.403*** (0.000)	4.281	6.524
	High	4.180*** (0.000)	3.284	5.076

Source: Author's Calculations
Note: p-values are given in parentheses. ***, **, * show significance at 1%, 5% and 10% levels respectively.

We also use initial per capita GDP (y0) and human capital (hc) as core determinants of economic growth, which are significant at 1 % level. The coefficient of y0 is negative and reports the convergence which is consistent with the findings of Barro and Sala-i-Martin (1995) and Mankiw et al. (1992). Further, the impact of human capital (hc) on economic growth is positive and significant at 1% level.

The impact of control variables (inflation, investment, trade openness, and government size) on economic growth is the same as expected, and consistent with previous studies. For example, inflation (inf) has a negative impact on economic growth in the model (2) which is significant at 1% level, whereas a 1% increase in inflation decrease economic growth by 1.170% in 5 years, these results are consistent with the results of Barro and Sala-i-Martin (1995) and Fisher (1993). Investment (inv) has a positive and statistically significant (at 1% level) impact on economic growth that is consistent with Mankiw (1992) and Barro and Sala-i-Martin (1995). Similarly, trade openness (open) has a significant and positive impact on economic growth. Further, government size (gov) has a negative and significant impact on economic growth in the model (2) which is consistent with the results of Fisher (1993).

4.1 Conditional Indirect Effects

The conditional indirect effects of child nutrition (nutpca) and child water and sanitation (wspca) on economic growth through the channels of child health (healpca) are shown in Table 2. We use the baseline models of Table 1 and equations (5) through (8) to calculate these conditional indirect effects. The estimation results of these effects along with their 95% confidence intervals are provided in the table.

Table 2 shows that the indirect impact of child nutrition (nutpca) on economic growth is positive but insignificant at all three levels of nutrition (nutpca). However, the indirect effect of water and sanitation (wspca) on growth is positive and significant (at 1% level) at low, average, and high levels of water and sanitation (wspca). These findings indicate that child health plays an important role in defining the effects of child access to water and sanitation on economic growth.

The indirect effects of nutpca and wspca on economic growth through the channel of child health at low, average, and high levels of nutpca and wspca for our final model are shown in Table 3.

Our results from the final model, as shown in Table 3, are consistent with our findings in Table 2. That is, the indirect effects of nutpca on growth through the channel of healpca are positive but insignificant at all levels of nutpca, whereas the indirect effects of wspca through the same channel on growth are positive and significant at 1% level. Overall, these findings show that child health plays an important role in defining the positive impact of child nutrition and access to water and sanitation on economic growth even after the inclusion of control variables in the baseline model.

5 Conclusion and Policy Recommendations

Our panel data analysis confirms that child nutrition, health, and education have a direct positive impact on long-run economic growth. Therefore, governments and social organizations should focus on programs that ensure the provision of these basic needs of children's well-being. Investment in children is very important for those countries that are pursuing the goals of high economic growth. Investment in children provides a solid ground for more equitable and sustainable economic growth in the future. It is important to focus on improvements in child well-being while designing the policies to alleviate poverty from our economy, particularly when the gap between education, nutrition, health, and access to water and sanitation levels for rich and poor children is increasing over time.

This study has considered four dimensions of child well-being. In the future, more dimensions like “social protections for children” and “early childhood development programs” can be incorporated to get a more comprehensive view of the impact of child well-being on economic growth. Furthermore, the data limitation problem especially for child nutrition can be overcome by conducting survey-based studies.

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Appendix

Table:1A

Principal Component Analysis of Child Health Indicators (healpca)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.18185	2.51987	0.7955	0.7955
Comp2	.661984	.573634	0.1655	0.9610
Comp3	.0883506	.0205366	0.0221	0.9830
Comp4	.067814	.	0.0170	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
cm	-0.5130	0.4241	0.5268	0.5286	0
immdpt	0.5119	0.4342	-0.4455	0.5924	0
immmes	0.4888	0.5552	0.4909	-0.4603	0
le	0.4856	-0.5686	0.5321	0.3972	0

Table:2A

Principal Component Analysis of Child Education Indicators (edupca)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.64599	2.38017	0.8820	0.8820
Comp2	.265822	.177638	0.0886	0.9706
Comp3	.0881843	.	0.0294	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Unexplained
npe	0.5701	-0.6727	0.4717	0
nse	0.5645	0.7379	0.3700	0
pscr	0.5969	-0.0553	-0.8004	0

Table: 3A

Principal Component Analysis of Child Nutrition Indicators (nutpca)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.84673	1.69346	0.9234	0.9234
Comp2	.153268	.	0.0766	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
mha	0.7071	0.7071	0
mwa	0.7071	-0.7071	0

Table:4
Principal Component Analysis of Water and Sanitation Indicators (wspca)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.81894	1.63788	0.9095	0.9095
Comp2	.181059	.	0.0905	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
imw	0.7071	0.7071	0
ims	0.7071	-0.7071	0