Evaluating the Kuznets curve relationship between economic growth and child labor in an emerging economy

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Abstract

Purpose – This study aims to test the Kuznets curve between economic growth and child labor, along with the influence of exports, household size and rural population in the context of Pakistan.
Design/methodology/approach – To achieve the research objective, this study applied the unit root test, bound co-integration test, and autoregressive distributive lags (ARDL) method for the period of 1972–2021.
Findings – The findings show an inverted U-shaped relationship between economic growth and child labor indicating that at the beginning stage of economic development, child labor increases due to lower per capita household and subsequently, in the long-run of economic development, child labor decreases due to the higher per capita households. Moreover, the results also show that exports, household size and rural population have a positive influence on increasing child labor.
Research limitations/implications – The policymakers and government of Pakistan need to focus on long-term economic growth policies, ensure free quality education and cheap equipment which practices minimum manpower to reduce the threat of child labor.
Social implications – Having long-run economic growth, the government of Pakistan need to equally benefit the households and the poor population to reduce child labor and enhance the social welfare of society.
Originality/value – To the best of the authors' knowledge, this is the first study that investigates the Kuznets curve relationship between economic growth and child labor in the context of Pakistan. Moreover, this study contributes to the reduction in child labor through long-term economic growth in the context of Pakistan.

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1. Introduction

Despite the recent development of regulations, laws, awareness and various codes of conduct, child labor remains a crucial issue in many parts of the world (Aminu *et al.*, 2022; Deggau *et al.*, 2023; Haider and Qureshi, 2016; Katav Herz and Epstein, 2022; Mansoor *et al.*, 2022), particularly in emerging economies (Hirway, 2000). The term child labor is a complex term perceived differently by different economist (Dessy and Pallage, 2001). According to Grier (2004), child labor is the employment of children of lower age who work in an unstable and unsafe environment. Other researchers argued that child labor is the exploitation of children's energies and basic rights at the workplace rather than providing an opportunity to get enough education (Basu *et al.*, 2010; Latif *et al.*, 2020). Child labor is the source of economic means in most emerging and poor economies where children work as labor in different working places to fulfill their households' basic needs (Aminu *et al.*, 2022; Barrech *et al.*, 2019). Although, emerging economies have made a significant reduction in child labor in the last 20 years, the rate of child labor is still high (Latif *et al.*, 2020). For instance, the international labor organization (ILO) reported that 263 million child laborers work in the business world, particularly those aged between 8 and 15 years old (ILO, 2017). One important reason for the increase in child labor in emerging economies is either too high or too low economic growth (Latif *et al.*, 2020).

Given the increasing importance of economic activities, population displacement and prosperity (Islam *et al.*, 2022; Mansoor *et al.*, 2022), economic growth is recently expected to have a Kuznets (1955) [1] -effect on the supply of children entering the labor market (Idris and Zaleha, 2015). For instance, economic growth in the short-run is expected to increase child labor and subsequently economic growth in the long-run reduces child labor (Idris and Zaleha, 2015). This is due to the fact that initially, economic growth would result in an increase in the demand for child labor, particularly in areas where poverty is severe. On the other hand, long-run economic development would result in a decline in both demand for child labors and supply of such child workers over time because of the gradual improvement in household incomes and regional prosperity (Ali and Soharwardi, 2022; Aminu *et al.*, 2022; McBeth and Hopkins, 2009; Idris and Zaleha, 2015).

Despite the increase role of government, ILO and other legal institutions in reducing child labor in emerging economies (Figueiredo and Lima, 2022; Ibrahim *et al.*, 2019; ILO, 2017; Thoma *et al.*, 2021), the number of child labor is still high (Deggau *et al.*, 2023). Given that economic growth significantly impacts child labor (Basu *et al.*, 2010; Idris and Zaleha, 2015; Latif *et al.*, 2020), empirical studies on how economic growth impacts child labor and the underlining mechanism have not been sufficiently addressed. A comprehensive review of the literature reveals that no single study has been conducted yet in Pakistan that empirically investigated the Kuznets curve relationship between economic growth and child labor (for detail, see Barrech *et al.*, 2019; Majeed and Kiran, 2019). Emerging economies are necessarily distinct from one another and thus may have different economic growth rates (Khan *et al.*, 2019; Ali *et al.*, 2021). Therefore, to fill the research gap, this study aims to examine the underlying mechanism of Kuznets curve relationship between economic growth and child labor in the context of Pakistan.

Our research contributes to the literature in many ways. First, a substantial number of existing studies on child labor have considered the significant role of different factors affecting child labor, including inadequate educational opportunities, poverty and gender inequality (Ashfaq *et al.*, 2017; Basu *et al.*, 2010; Deggau *et al.*, 2023; Giang, 2023; Hussain and Kashif, 2013; Ibrahim *et al.*, 2019; Idris and Zaleha, 2015). However, to the best of our knowledge, no study has been conducted on the Kuznets curve relationship between

economic growth and child labor in the context of Pakistan. Thus, this is the first study that examines the proposed relationship in the context of Pakistan. Second, we contribute to the literature that the Kuznets curve relationship and the underline mechanism between economic growth and child labor are patterned differently from prior literature in Pakistani contexts due to the distinctive institutional settings. The intuitional context is different across different jurisdictions with different regulatory settings (Khan *et al.*, 2019). Thus, our research offers a unique contextual empirical investigation indicating that the relationship between economic growth and child labor is patterned differently from other emerging economies. Third, we used the latest autoregressive distributive lags (ARDL) to determine the impact of economic growth on child labor in Pakistan for a period of 50 years, from 1972 to 2021.

2. Literature review

The issue of child labor is as old as humankind. In the second half of the 20th century, there is an international consensus to end child labor to protect children's future discourses (Figueiredo and Lima, 2022). Existing studies have provided an important basis for understanding the causes of child labor, both theoretically and experimentally (Ashfaq *et al.*, 2017; Basu *et al.*, 2010; Bouoiyour and Miftah, 2014; Deggau *et al.*, 2023; Dessy and Pallage, 2001; Fumagalli and Martin, 2023; Hailu and Girma, 2022; Ibrahim *et al.*, 2019; Khalid and Shahnaz, 2004; Kumar, 2013; Lopez-Calva, 2002; Majeed and Kiran, 2019; Thoma *et al.*, 2021; Younas *et al.*, 2020). Prior studies have found that child labor and economic growth are associated with each other, forming an inverted U-shaped relationship called the Kuznets curve (Idris and Zaleha, 2015; Kambhampati and Rajan, 2006). This Kuznets curve is most significant in emerging economies as at the beginning of development, a country's per capita growth is very low, and people are facing poverty problems which increase the demand for adult and child labor for rapid economic growth in the short run. For instance, Kambhampati and Rajan (2006) investigated the Kuznets curve for child labor in the context of India and found an inverted U-shaped correlation between economic growth and child labor.

Similarly, Edmonds and Pavcnik (2006) found that the countries with high trade capacity have less child labor. Kis-Katos (2007) found a positive relationship between trade and child labor. Del Carpio (2008) examined the income of households and child labor and found an inverted U-shape relationship. McBeth and Hopkins (2009) examined the linkage between a nation's ratio of child labor frequency and per capita gross domestic product (GDP). They found that GDP and its square have both a positive and negative effect on child labor respectively with an inverted U-shaped relationship. Davies and Voy (2009) found that foreign direct investment has a negative effect on child labor. Basu *et al.* (2010) found an inverted U-shaped relationship between family earnings and child labor. Idris and Zaleha (2015) found that child labor increases initially as economic growth increases and declines when the economic growth continues.

Other studies also examined child labor with other variables. For instance, existing literature investigated the effect of household wealth (Basu *et al.*, 2010; Bouoiyour and Miftah, 2014; Fumagalli and Martin, 2023), financial development (Dehejia and Gatti, 2005) and the household structure (Kumar, 2013) on child labor in various geographical contexts. More recently, researchers found that the economic needs of families influence positively the engagement of child labor in emerging economies (Kumar *et al.*, 2021), therefore, the rate of child labor is higher in developing economies than in developed economies. Ali and Soharwardi (2022) found that parents' and family size are the factors that increase child labor. Figueiredo and Lima (2022) also found that trade liberalization reduces child labor in emerging economies. Hailu and Girma (2022) found that child labor increases with household asset ownership. Zungu and Greyling (2022) found a nonlinear relationship between government expenditure and economic growth in African countries.

More specifically, due to the poor economic status of Pakistan (Islam *et al.*, 2022), children are working in organizations to support their families economically (Shrestha, 2011). The situation is worsened in rural areas where poverty-stricken families rely on child labor (Ashfaq *et al.*, 2017). Poverty, economic instability, large family size, lack of awareness, lack of education, overpopulation and many more are the reasons that are responsible for child labor in Pakistan (Elghazally *et al.*, 2022; Human Rights Commission of Pakistan, 2011). Khalid and Shahnaz (2004) found that family earnings, parents' education and family responsibility are the other factors affecting child labor. Hussain and Kashif (2013) concluded that the working status of parents affects child labor in Pakistan. Haider and Qureshi (2016) reported that lower parents' income and education increase child labor. Latif *et al.* (2020) found that families' financial status affect child labor. Given the fact that the existing studies provide a link between economic growth and child labor in different contexts (for detail, see Basu *et al.*, 2010; Figueiredo and Lima, 2022), no single study has been conducted in the context of Pakistan that examined the Kuznets curve relationship between economic growth and child labor. Moreover, no single study considers both the supply and demand sides of child labor and economic growth in Pakistan. Therefore, this study investigates the Kuznets curve relationship between economic growth and child labor in the context of Pakistan.

3. Research methodology

3.1 Data and sample

The context of this study is the economy of Pakistan. Child labor is a global issue confronted by many countries around the globe, including Pakistan (Ashfaq *et al.*, 2017). According to the State Bank of Pakistan, the economic growth of Pakistan is unstable (SBP, 2019), which is evidence to address the Kuznets curve relationship between economic growth and child labor. Therefore, this study is conducted in the context of Pakistan. The essential domain of any research is selecting a suitable research method that provides a solution to the research problem that is investigated (Abdullah and Raman, 2001). The suitability of the research method depends on the "efficiency and informational adequacy" of the methods used in gathering data. We therefore applied time series data retrieved from the World Bank (2021) and world development indicators (WDI) for 50 years from 1972 to 2021.

3.2 Variables measurement

Following previous literature, we used child labor (CHILD) as a dependent variable (Basu *et al.*, 2010; Giang, 2023; Kambhampati and Rajan, 2006). Researchers used various proxies to measure child labor, including non-attendance school rates (Basu *et al.*, 2010; Elghazally *et al.*, 2022; Psacharopoulos, 1997) and the percentage of primary-school-age children not enrolled in primary or secondary education (Idris and Zaleha, 2015). We used the percentage of primary-school-age children not enrolled in primary or secondary education as a proxy for CHILD. Following Khan *et al.* (2021), economic growth is used as an independent variable. We used GDP per capita (in constant local currency units) as a proxy for economic growth and square of GDP per capita (in constant local currency units) as a proxy to verify the child labor Kuznets curve (Kambhampati and Rajan, 2006). Following existing literature, we used a set of control variables including export, household size and rural population (Adonteng-Kissi, 2023; Aminu *et al.*, 2022; Figueiredo and Lima, 2022; Idris and Zaleha, 2015). The definitions and sources of variables used in the study are shown in Table 1.

3.3 Econometric techniques

3.3.1 Unit root test. Initially, we used Kwiatkowski, Phillips, Schmidt and Shin (KPSS) unit root tests to find the order of integration (Mansoor *et al.*, 2022). This test is used to verify the results and to investigate the possibility that a series is fractionally integrated (i.e. neither I(1) nor I(0) (Kwiatkowski *et al.*, 1992). The maximum lag order for the test is calculated using a rule provided by Schwert (2002).

Variable name	Variable abbreviation	Definition and measurement	Source
Child labor	CHILD	Children out of school (CHILD) are a measure of child labor (percent of primary school age). The percentage of children that are primary school age but are not enrolled in primary or secondary school	(World Bank)
Gross domestic product	GDP	GDP per capita is calculated by dividing the gross domestic product by the mid-year population (in constant local currency units). This is the entire gross value added in the economy	(World Bank)
Square of GDP	GDP^2	Square of gross domestic form estimated as taking square of GDP (in constant local currency units)	(World Bank)
Exports	EXP	The value of all commodities and other market services offered to the rest of the world	(World Bank) (WDI)
Child population	CHPOP	CHPOP is the percentage of the total child population between ages 0–14 years	(World Bank)
Rural population	RURAL	Rural population (percentage of the total population) is the number of people who live in rural regions and computed as the difference between urban and total population	(World Bank)

Note(s): Table 1 show the definitions, measurement, and sources of variables covering the time series data for the period 1972–2021 for Pakistan
Source(s): Developed from authors own source

Table 1. Definitions of variables, measurement and sources

3.3.2 Econometric model. We used the following econometric model to investigate the U-shaped relationship between economic growth and child labor for the period of 1972–2021. Additionally, most of the variables are time-consistent in the current research. Therefore, the ARDL method is found to be more appropriate for finding the Kuznets curve relationship between economic growth and child labor. Prior studies also used the ARDL method for research on child labor and economic growth (Adnan *et al.*, 2020; Mohamed *et al.*, 2021; Shaari *et al.*, 2019).

$$\boldsymbol{CHILD_t = \beta_0 + \beta_1 GDP_t + \beta_2 GDP2_t + \beta_3 EXP_t + \beta_4 CHPOP_t + \beta_5 RURAL_t + \varepsilon_t} \quad (1)$$

Where,

CHILD = Represents child labors used as a dependent variable.

t = Time series (indicates the annual period from 1972 to 2021)

$\beta 0$ = Intercept (has constant value)

$\beta 1 - \beta 5$ = Coefficient scope

GDP = Gross domestic product

GDP^2 = Quadratic form of GDP

EXP = Export

CHPOP = Child population ages from 0 to 15 years

RURAL = Rural population

ε = Error term

In order to run the ARDL bounds testing procedure, it is necessary to determine the optimal lag length of the model for the value of joint F-statistics (Khan *et al.*, 2021). We used the general-to-specific modeling approach guided by the Hannan-Quinn (HQ) criterion (Pesaran and Shin, 1998). Hence, by expending Equation (1), the short-run dynamics of the model can be specified as follows:

$$\Delta CHILD_t = \beta_0 + \sum_{i=1}^{p} \beta 1 \Delta(CHILD_{t-1}) + \sum_{i=1}^{q1} \beta 2 \Delta(GDP_{t-1}) + \sum_{i=1}^{q2} \beta 3 \Delta(GDP2_{t-1}) + \sum_{i=1}^{q3} \beta 4 \Delta(EXP_{t-1}) + \sum_{i=1}^{q4} \beta 5 \Delta(CHPOP_{t-1}) + \sum_{i=1}^{q5} \beta 6 \Delta(RURAL_{t-1}) + \varepsilon_t \quad (2)$$

Where, "Δ" represents the different form of the variable. "*p*" and "*q*" represent the lag values of dependent and independent variables, respectively. In each case, the lower bound is based on the assumption that all of the variables are I(0), and the upper bound is based on the assumption that all of the variables are I(1). Following Pesaran and Shin (1998), if the calculated F-statistic is less than the lower bound, the study would conclude that there is no co-integration. Similarly, if the calculated *F*-statistic exceeds the upper bound, the study would conclude that there is co-integration. Finally, if the calculated *F*-statistic value falls between the bounds, the test would be inconclusive. By expending Equation (1), the long-run dynamics of the model can be specified as follows:

$$\Delta CHILD_t = \beta_0 + \beta 1 CHILD_{t-1} + \beta 2 GDP_{t-1} + \beta 3 GDP2_{t-1} + \beta 4 EXP_{t-1} + \beta 5 CHPOP_{t-1} + \beta 6 RURAL_{t-1} + \varepsilon_t \quad (3)$$

4. Results and discussion

4.1 Descriptive statistics

The descriptive statistics of the dependent, independent and control variables are shown in Table 2. The average value of CHILD is 38.712 with a range from 24.574 to 44.701. The mean value per capita GDP is 40632.28, with a maximum value of 61881.75 and a minimum value of 23394.72. Similarly, 1760073 is the average value of GDP^2 which ranges between 3,829,350 and 5,473,128. The mean value of exports is 13.197, with a minimum value of 8.257 and a maximum value of 17.359. The average value of the child population (CHPOP) between ages 0–14 is 41.068. Finally, the average value of RURAL is 68.454, which ranges between 63.334 and 74.647. Additionally, the Jarque Bera test value shows that CHILD with a value of 12.027 and CHPOP with a value of 8.961 are normally distributed.

Table 2 also presents the pairwise correlation between the variables. Following Gujarati and Porter (2009), a coefficient value of more than 0.80 to 0.90 appears to indicate the existence of multicollinearity in the model. Our study is free from multicollinearity problems as the coefficient values of all the variables fall below 0.80.

4.2 Unit root test

Table 3 shows the results of the unit root test, also called the KPSS test. As shown in Table 3, that in both the intercept and trend levels, some variables are nonstationary because they are integrated of order one, I(1), while others are stationary at order zero, I(0). This indicated the importance of using the bound-ARDL calculation method to perform a co-integration test and

Variable	Mean	Std. dev.	Max.	Mini.	Jarque-Bera	CHILD	GDP	GDP2	EXP	CHPOP	RURAL
CHILD	38.712	4.818	44.701	24.574	*12.027****	1.000					
GDP	40632.281	10557.607	61881.755	23394.722	1.758	−0.260	1.000				
GDP2	1,760,073	8,712,168	5,473,128	3,829,350	2.453	*−0.705**	*0.391***	1.000			
EXP	13.197	2.501	17.359	8.257	1.900	*0.213****	*0.068***	−0.431	1.000		
CHPOP	41.068	2.660	43.260	35.269	*8.961***	*0.560**	*−0.557***	−0.401*	0.344	1.000	
RURAL	68.454	3.285	74.647	63.334	2.720	0.609	−0.786	*−0.665**	−0.529	0.765	1.000

Note(s): Table 2 depicts the descriptive statistics such as mean, minimum, maximum, standard deviation, Jarque-Bera and pairwise correlation. Values documented in Table 2 are the coefficient of correlation, while the *, ** and *** represent significance at 10%, 5% and 1% levels

Source(s): Developed from authors own source

Table 2.
Descriptive statistics and correlation matrix

Variable	Levels Test statistics	Levels Critical value	Levels Remarks	First difference Test statistics	First difference Critical value	First difference Remarks
Intercept						
CHILD	0.770*	0.463	I(0)	0.302	0.463	I(0)
GDP	0.886*	0.463	I(0)	0.151	0.463	I(0)
GDP2	0.881*	0.463	I(0)	0.379	0.463	I(0)
EXP	0.475*	0.463	I(0)	0.237	0.463	I(0)
CHPOP	0.710*	0.463	I(0)	0.624*	0.463	I(1)
RURAL	0.892*	0.463	I(0)	0.690*	0.463	I(1)
Intercept and trends						
CHILD	0.173*	0.146	I(0)	0.271*	0.146	I(1)
GDP	0.086	0.146	I(I)	0.163*	0.146	I(1)
GDP2	0.171*	0.146	I(0)	0.098	0.146	I(0)
EXP	0.195*	0.146	I(0)	0.083	0.146	I(0)
CHPOP	0.224*	0.146	I(0)	0.100	0.146	I(0)
RURAL	0.222*	0.146	I(0)	0.137	0.146	I(0)

Note(s): 5% level of significance denoted by "*" is carried out for all variables in KPSS unit root tests. Variables stationary at zero-order are represented by I(0) and I(1) is used for stationary at integrated order one
Source(s): Developed from authors own source

Table 3.
KPSS Unit root test

determine the variables' long-run relationship as both I(0) and I(1) integrated variables exist in the model.

4.3 Optimal lag selection

We used the final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC) and HQ information criteria (HQIC) to find the lag order selected by each criterion. These criteria are applied to determine the maximum lags for co-integration in the model. The HQIC criteria are used to determine the optimal lag length based on the general-to-specific modeling approach. Table 4 shows the maximum lags of 4 lags selected for each variable based on the HQIC findings.

4.4 Bound co-integration test

Using the bound co-integration framework and the critical value calculated by Pesaran *et al.* (2001), the *F*-test statistics value 5.988 given in Table 5 is significant at the 1% level for Model 1 and above the upper critical value at 10%, 5% and 1%. The finding of the bound test confirms the existence of long-run valid connections between economic growth and child labor.

Lag	LR	FPE	AIC	SIC	HQIC
0	NA	3.29e+23	71.17649	71.42223	71.26711
1	773.7939	8.25e+14	51.35663	53.07687	51.99100
2	115.8857	1.02e+14	49.16819	*52.36293**	50.34631
3	*59.23028**	6.09e+13	48.37468	53.04391	50.09655
4	42.42587	*5.64e+13**	*47.69211**	53.83583	*49.95772**

Note(s): The italic values represent the significant variables at 10%, 5% and 1% level of significance respectively. *denotes lag order selected by each criterion. FPE: represents Final prediction error, AIC is for Akaike information criterion, SIC: Schwarz information criterion, HQIC: Hannan-Quinn information criterion
Source(s): Developed from authors own source

Table 4.
Optimal lag selection test

4.5 Auto-regressive distributive lags (ARDL) analysis

4.5.1 ARDL short run relationship analysis. After the development of the co-integration connection between the variables used in the study, we first test the short-run relationship using the ARDL method. Table 6 shows the findings of the short-run equilibrium with the (4, 4, 0, 0, 0, 0) optimal number of lags for the variables. Here by (4, 4, 0, 0, 0, 0), we mean that the ARDL test selects 4 lags of the dependent variable (i.e. CHILD) and 4 lags of the first independent variable (i.e. GDP). On the other hand, all the other independent variables have zero lags. Except for export, the coefficients are significant at the 5 and 10% confidence levels. The Error Correction Term (ECT) value is −2.696, which is highly significant with the expected negative sign. The ECT represents the speed at which the variables in the model return to equilibrium after a shock or disturbance. It is a measure of the long-run relationship between the variables in the model. The diagnostic tests for the model also show that the model is statistically significant, with a significant *F*-test value and no heteroskedasticity. The R-Square value is 0.7420, which indicates that 74.20% variation in the dependent variable is caused by independent variables. Thus, the findings of short-run ARDL confirm the effect of economic growth on child labor in Pakistan.

4.5.2 ARDL long-run relationship analysis. As shown in Table 6, Model 3, the long-run relationship between the variables is found using the ARDL method with the HQIC. The findings show that the GDP per capita coefficient is positively significant, while the GDP^2 per capita is negatively significant with child labor. The findings confirm the inverted U-shaped relationship called the Kuznets curve between economic growth and child labor by way of the GDP per capita, which has a positive effect while its square has a negative impact on child labor. The positive GDP per capita has a very low coefficient value, which shows that the economic growth of the country has the least effect on the rise in child labor in short term. Subsequently, economic growth of the country highly reduces demand for child employment in the long-run. This may due to the high economic development, higher technologies usage and higher per capita income of households.

Similarly exports, household income and rural population are positively significant to child labor. This indicates that with an increase in exports of the country, the number of child laborers also increases in the working sector. Given that Pakistan mostly exports raw materials rather than finished goods which require unskilled labor because of the unskilled nature of the job. Hence, child laborers in Pakistan usually do their jobs at lower levels where skills are not required. This is consistent with Kumar *et al.* (2021) findings who argued that labor age is an essential factor in determining the occupational choice. The finding also indicates that household size measured by child population has also increased the child labor in Pakistan. Pakistan is the 6th most populated country in the world and its population is increasing by 2% annually which means that the household size is increasing while GDP growth is not increasing according to the level of increasing population. As a result, householders become unable to cover their expenditure and they prefer to involve their children in the labor sector.

F-statistics value	5.357***	5.988***
Significance	I(0)	I(1)
10%	2.752	3.797
5%	3.125	4.253
1%	3.936	5.239

Note(s): In the bound test, I(0) is used for integrated order zero and I(1) is used for integrated order one
Source(s): Developed from authors own source

Table 5. Bound co-integration test

Variables	Model (2) ARDL short-run relationship β (std. error)	Prob.	Model (3) ARDL long-run relationship β (std. error)	Prob.
GDP			0.0003**	0.0109
			(0.0001)	
GDP2			−1.6411***	0.0001
			(1.3750)	
EXP			0.1280**	0.0236
			(0.0513)	
CHPOP			0.4821***	0.0010
			(0.1360)	
RURAL			6.2835***	0.0003
			(0.7205)	
D(CHILD)	*−1.7323****	0.0003		
	(0.2721)			
D(CHILD(−1))	*1.5367****	0.0000		
	(0.3233)			
D(CHILD(−2))	*0.7802***	0.0011		
	(0.2280)			
D(CHILD(−3))	*0.4979****	0.0062		
	(0.1689)			
D(GDP)	*0.0020****	0.0001		
	(0.0006)			
D(GDP(−1))	*0.0011****	0.0011		
	(0.0005)			
D(GDP(−2))	*0.0019****	0.0018		
	(0.0004)			
D(GDP(−3))	*0.0008***	0.0316		
	(0.0003)			
D(GDP^2)	*−4.4260****	0.0001		
	(9.8623)			
D(EXP)	0.3471	0.1860		
	(0.2569)			
D(CHPOP)	*1.2992***	0.0389		
	(0.5999)			
D(RURAL)	*16.9460***	0.0020		
	(5.0557)			
ECT(−1)	*−2.6967****	0.0000		
	(0.4145)			
@TREND	*5.4170****	0.0000	*5.4175****	0.0000
	(0.8376)		*(1.3820)*	
_CONS	*−12.5000****	0.0003	*−12.5800****	0.0042
	(15.6865)		*(3.7504)*	
F-statistic	*10.0278****	0.0000	*30.5314****	0.0000
Heteroskedasticity Test	1.2653	0.2872	1.2657	0.2875
Durban–Watson statistic	2.1202		2.1028	
R-squared	0.7420		0.8180	

Note(s): The non-parentheses figure shows the coefficient value while the parentheses figure shows the standard error of variables. ARDL (4, 4, 0, 0, 0 and 0) selected based on Hannan-Quinn criterion (HQ). "D" is a different form of variable. The italic values represent the significant variables at 10%, 5% and 1% level of significance respectively. The *, ** and *** represent statistically significant at less than 0.10, 0.05 and 0.01 levels respectively

Source(s): Developed from authors own source

Table 6. Auto-regressive distributed lag (ARDL): short-run and long-run analyses

The results also highlight that the rural population increased child labor in Pakistan. The effect of the rural population has the highest coefficient value which indicates that child labor is mostly available in the rural areas of Pakistan. The findings support the theoretical concept of Kuznets curve between economic growth and child labor (Kambhampati and Rajan, 2006; McBeth and Hopkins, 2009). The diagnostic tests for the model also show that the model is statistically significant, with a significant *F*-test value. Moreover, there is no neglected heteroskedasticity as confirmed by heteroskedasticity test and Durbin Watson statistics value respectively. The R-square value is 0.8180 indicates that 81.80% variation in the dependent variable is caused by independent variables. Thus, the findings of the ARDL long-run results confirm the effect of economic growth on child labor in Pakistan.

5. Conclusion

Drawing on limited literature, we investigated the Kuznets curve relationship between economic growth and child labor for the period of 1972–2021 in the context of Pakistan. Using the ARDL method, the results show the inverted U-shaped Kuznets curve relationship between economic growth and child labor. The results indicate that at the beginning stage of economic development, child labor increases due to the lower per capita income of a household while at the later stage of high economic development, with technology usage and higher per capita of households, the demand for child labor decreases. Therefore, we conclude that economic growth in the short-run increasing child labor while decreasing it in the long-run. Our result supports the basic mechanism of the Kuznets curve (Idris and Zaleha, 2015; Kambhampati and Rajan 2006). Moreover, not all the variables have a similar effect on child labor. For instance, the household size and rural population have a strong influence on increasing child labor (for detail, see Elghazally *et al.*, 2022; Figueiredo and Lima, 2022) while exports have a weak influence on increasing child labor in Pakistan. Thus, we conclude that household size and rural population strongly influence child labor, while exports weakly influence child labor.

Unlike other empirical studies on economic growth and child labor in Pakistan (for detail, see Zafar and Zafar, 2022), we addressed the research gap by investigating the Kuznets curve relationship between economic growth and child labor. We responded to the recommendations made by Idris and Zaleha (2015) and Latif *et al.* (2020), pointing out that empirical studies on economic growth and child labor are limited. We contributed to the literature that the relationship between economic growth and child labor is patterned differently in Pakistan from prior studies in other economies due to the distinctive institutional setting, economic policies and economic development programs. We responded to the suggestion made by Ali *et al.* (2021) that the future study should focus on long term economic growth to produce sustainable human capital. Moreover, we have also responded to the recommendations made by Zafar and Zafar (2022), highlighting the high need for new economic policies to facilitate long-term growth effectiveness in the economy of Pakistan.

We offer policy implications to the regulators and policymakers. Given the high difficulties in growth factors (Siddiqui, 2004) due to higher population, large household size and minimum exports (Khalid and Shahnaz, 2004; Javid, 2019), the economy of Pakistan needs to adopt a better strategy to attract and retain long term economic growth. For instance, child labor in the economy of Pakistan creates a child labor cycle. Parents with low income allow their children to do labor work to fulfill their basic needs (Ali and Soharwardi, 2022). These children grow up unskillful and uneducated, hence repeating the same cycle when they become parents, as the employment status of parents directly transfers to their children (Morales, 2019). Therefore, the policymakers and the government of Pakistan should devise a step-by-step policy for long-term economic growth to eradicate the evil of child labor.

Quality education for rural populations is not readily available. Therefore, policymakers and regulatory authorities should ensure the availability of free and quality education to all the people living in Pakistan. Moreover, there should be a stipend to encourage parents to send their children to school.

The results are presented with high care in the presence of some limitations. First, our selected sample consists of the context of Pakistan which is only generalizable to the Pakistani context. This study does not generalize to other economies. This is due to the fact that every economy has its own jurisdiction, institutional setting and economic policy. We contend that the Kuznets curve relationship between economic growth and child labor may differ in other countries. Therefore, a future research study in a similar context may offer different results in different economies comparable to the results offered by the current study. Second, the study is almost limited to male children. Female children tend to be more often engaged in domestic work than male children (Asravor, 2021; Offiong *et al.*, 2021). Pakistan is a religious country and mostly female children are working in houses in rural areas. The parents almost never allowed them to read in a co-educational system. Hence, it would be interesting to investigate Kuznets curve relationship between economic growth and female child labor, to promote female education and reduce the female child labor. Considering the above limitations and future study directions, we contend that our research is relevant, timely and contributes to the relevant literature on the Kuznets curve, economic growth and child labor.

Note

1. Kuznets curve or Kuznets perspective is mainly presented by Kuznets (1955) and applied by Kambhampati and Rajan (2006) who argued that various economic activities have a U-shape relationship with child laborers.

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