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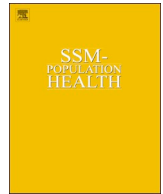




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## Article

## The impact of increasing the minimum legal age for work on school attendance in low- and middle-income countries

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## ABSTRACT

Several countries have increased their legal minimum age for work in line with international conventions on child labor. We evaluated the effect of increasing the legal minimum age for work on school attendance in 3 low- and middle-income countries using difference-in-differences analyses. Increasing the legal minimum age for work increased school attendance by 3.0 (0.2, 5.8) percentage-points in Malawi, and 2.0 (0.2, 3.6) percentage-points in Colombia. In Malawi, we found a greater policy effect among girls compared to boys. In Colombia, the poorest tercile experienced the greatest improvement in educational outcomes. We found no evidence of an impact of increasing the legal minimum age for work on school attendance in Burkina Faso. Our findings suggest that increasing the legal minimum age for work has had a positive effect on educational outcomes in some low and middle income countries.

## 1. Introduction

The International Labor Organization (ILO) estimates that about 150 million children aged 5–17 years worldwide were engaged in work which qualifies as child labor in 2016 (ILO, 2017). The ILO defines child labor as “work that deprives children of their childhood, their potential and dignity, and that is harmful to their physical and mental development” (ILO, 2016). In line with the principles set out in the ILO conventions on child labor (ILO Conventions 138 on the minimum age for legal work, and 182 on the elimination of the worst forms of child labor) (ILO, 2000, pp. 1–4; ILO, 1973, pp. 1–6), several countries have enacted laws setting or increasing the legal minimum age for work (henceforth LMAW).

Child work has been found in several studies to be negatively associated with school attendance and educational attainment (Heady, 2003; Khanam & Ross, 2011; Patrinos & Psacharopoulos, 1995; Psacharopoulos, 1997; Rosati & Rossi, 2003). Working children have been shown to have higher school drop-out rates and to complete fewer years of schooling overall. For example, Psacharopoulos (1997) found that Bolivian children in wage work completed nearly a year less schooling and Venezuelan working children completed two fewer years

of schooling than their non-working counterparts (Psacharopoulos, 1997). Ray (2002) similarly found that among Ghanaian children, educational attainment decreased by about a year for each additional hour of wage work per week. However, these empirical associations do not necessarily reflect true causal relationships for three reasons. Firstly, they may suffer from reverse causation—i.e. children may work because they have had to drop out of school for other reasons (household poverty, lack of access, poor quality of schools etc. (Huisman & Smits, 2015; Lloyd, Mensch, & Clark, 2000). Secondly, these associations may be confounded by factors (such as socio-economic position), which drive children to work and be out of school, and which are not always adequately controlled for in these studies. Thirdly, while working children have been shown to be less likely to complete school, many children, especially those who work part time for family businesses or seasonally, are able to effectively combine work and school (Patrinos & Psacharopoulos, 1995; Shafiq, 2007; Bhalotra & Heady, 2003; Coulombe & Canagarajah, 1999). The extra household income from working may actually facilitate the child's schooling by relieving all or part of the associated financial burden to the household (Maconachie & Hilson, 2016).

It is thus unclear that interventions aimed at limiting child work

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### Abbreviations

DHS	Demographic and Health Surveys
DiD	Difference-in-Differences
IHSP	Institute for Health and Social Policy
ILO	International Labor Organization
LMAW	Legal minimum age for work
LMIC	Low- and middle-income countries

would necessarily improve educational outcomes. To our knowledge, this question remains unresolved in the context of low- and middle-income countries (LMICs). While previous studies have examined the association between LMAW and secondary education rates at a national level, no previous study has looked longitudinally at how changes in LMAW affect individual outcomes (Heymann, Raub, & Cassola, 2013). In this study, we contribute to filling this gap by evaluating the effect of national legislation increasing the legal minimum age of work on school attendance in 3 LMICs. As secondary objectives, we examine how these effects vary by gender and socio-economic position.

#### 1.1. Study context

We conducted our study using data from Burkina Faso, Colombia and Malawi. In Burkina Faso, about 40% of children work, mostly in agriculture (ILO, 2014). Others work in artisanal mineral mines, especially gold mines, and in domestic service. Child labor in Burkina Faso is intricately linked with child trafficking. The country is both an origin and destination as well as transit point for children being moved across the sub-region to work in often hazardous conditions. Children are brought to Burkina Faso from Nigeria and Mali, while children from Burkina Faso end up in Ghana, Togo, Nigeria, Cote d'Ivoire, Niger and Mali (De Lange, 2007; Hounmenou, 2016). Burkina Faso has ratified the ILO convention 182 in 1999 and has enacted several domestic policies to protect children from hazardous work. It has also participated in several international initiatives to combat child labor including the ILO-IPEC LUTRENA project (ILO, 2019) funded by the US Department of labor, and similar projects in collaboration with France and the European Union. Since the adoption in 2007 of the Education Orientation Law (*AN Portant loi d'orientation de l'education.*, 2007), schooling has been ostensibly free and compulsory up to age 16, but in re access to education is still dependent on the local availability of schools and the household's ability to purchase school materials and spare children from working on behalf of their families (EPDC, 2014).

In Malawi, it is estimated that between about 25% of children aged 5–14 years of age engaged in economic activity in 2014 (USDOL, 2016a). Many children are trafficked internally, the boys to work in fishing, herding livestock, on tobacco farms as farm hands and street vendors, and the girls as domestics and sex workers (Malawi, in Country Reports on Human Rights Practices- 2014, 2015). As of 2008, Malawi had no compulsory education age but has provided free primary education since 1994 (Kadzamira & Rose, 2003; National Education Sector Plan 2008–2017, 2008; UNESCO, 2008). Child labor laws are enforced through the Ministry of Labor. The government has in place several policies and programs under the umbrella of the Child Protection Policy embedded within *Malawi's Growth and Development Strategy 2006–2011*. These policies make the elimination of child labor a priority (*Malawi Growth and Development Strategy II, 2011– 2016. Report No. 12/222, 2011*).

In Colombia, about 10% of children work, mostly in the informal sector (USDOL, 2016b). Most of them work in unpaid family farming activities, illegal mineral mines, as domestic servants, as street vendors and waiting tables. Some children are also involved in the drug trade. In urban areas especially, some older children are exploited for commercial sex work. There have been reports of trafficking of boys internally

for forced labor and girls abroad for sex work. Children in Colombia have also been caught up in the country's decades old civil war, being recruited by both warring factions as combatants and informants or camp followers. Some of the girls are even used as “wives” for the combatants (Oviedo-Trespalacios, Manjarrés, Maestre-Meyer, Peñabaena-Niebles, & Holgado, 2013; *Trabajo Infantil en Colombia, 2010*). Children are required to attend school from ages 5 to 15 and public schools are free (Borjas & Acosta, 2000). The Colombian constitution prohibits the economic exploitation of children and protects them from hazardous work as well as forced labor (*Código de la Infancia y la Adolescencia, Ley 1098 of 2006, 2006*).

## 2. Materials and methods

### 2.1. Data

We sourced data on changes in the legal minimum age of work from the McGill Institute of Health and Social Policy's (IHSP) PROSPERED Project's Child Labour Database (“PROSPERED Child Labor Policy Database,” n.d.). This database contains data on the working conditions and available legal protections for child workers in 122 countries. The database expands on the University of California, Los Angeles' (UCLA) WORLD Policy Analysis Center's database on child labour policies (“UCLA WORLD Policy Center Child Labor Database,” n.d.) by adding data from 1995 to 2012. It was coded from primary-source documents obtained from multiple sources such as national labour laws/codes, the ILO's NATLEX database and the Committee on the Rights of the Child (CRC). The information extracted has been translated into a set of characteristics that can be quantitatively analyzed. For example, for the purposes of this study, the coding involved extracting the legal minimum ages at which children were permitted to do all work, light work or work with permission using information from multiple legal and policy documents in which such information may not be explicitly stated. This coding was done independently by two researchers and the results harmonized according to rules set out systematically in a codebook.

We obtained information on educational outcomes from the Demographic and Health Surveys (Corsi, Neuman, Finlay, & Subramanian, 2012; ICF., n.d.). The DHS are repeated cross-sectional surveys conducted in several countries using multistage sampling to obtain nationally representative data on the demographic, socio-economic, fertility and health characteristics of their populations. While details vary from country to country, the surveys share standardized data-gathering tools and procedures enabling data to be compared across countries and surveys. The data is publicly available subject to registration. The details of DHS survey years and sample sizes included from each country are given in Table 2 below.

We included countries in this study if they had increased their legal minimum age of work and conducted at least two DHS surveys before the policy change and at least one afterwards. We further examined pre-exposure trends as discussed below and excluded countries with non-parallel pre-treatment trends in the outcome between treated and control groups. Based on these criteria, we included 3 countries (Burkina Faso, Colombia, Malawi) in our analysis. We used all available DHS surveys for each selected country in our sample and excluded observations with missing information on any covariate. Details of the policy changes for each country are given in Table 4. Within each country, we used data from all children aged from 12 to 17 years. We chose this age range as representative of children in post-elementary/secondary school. We repeated our analyses using children from ages 10 to 18 as a check on the sensitivity of our findings to the age range of the children included. We present those results in the Table 5. As we had very few missing data on our outcome and covariates across all surveys, we excluded observations with missing data on outcome and covariates from the analyses.

## 2.2. Measures

The treatment was a change in the minimum age for legal work, as stipulated in the country's law or implied by national policy, ignoring any exceptions and/or special provisions for light work. Details of the relevant legislation from the countries involved are provided in Table 4. Within each country, we compared age groups whose ability to work legally was altered by the policy change (henceforth, the “treated” group) to those who remained unaffected by the policy change (the “control” group). The age groups in our study were constructed from serial cross-sectional surveys and do not represent longitudinal age cohorts.

The outcome was school attendance, defined as having attended school in the year preceding the interview (1 = yes, 0 = no). This is a basic school participation indicator taken from the household surveys. For each child in the study, the survey question asked whether the child attended school in the previous year. This question was asked of all children in the household without regard to enrollment status.

We modeled the interactions between our exposure, and gender and socio-economic status in our analyses. For this purpose, we defined gender as binary (male/female) and socio-economic status as terciles of an asset-based wealth score estimated for each survey year and country. The score was derived using a principal components analyses of asset variables, as per the recommended DHS method (Rutstein S.O, 2015), and categorized by terciles for analysis.

## 2.3. Statistical analysis

We used a difference-in-differences (DiD) approach (Donald & Lang, 2007; Lechner, 2011; Lee & Kang, 2006) to model the effect of changes in the LMAW on school attendance within each country. DiD is a quasi-experimental method, which estimates the causal effect of an intervention as the change in an outcome comparing “treated” and “control”

groups, before and after an intervention. Under the identifying assumption that treatment and control groups would experience parallel time trends in the outcome in the absence of the policy change, this approach eliminates time-invariant confounding (both measured and unmeasured). The effect estimate from such a model can thus be interpreted as the causal effect of the intervention assuming no residual or time-varying confounding. Since we used serial cross-sectional surveys within each country in this study, we included year fixed-effects terms in our models to adjust for secular trends in the outcomes shared across age groups and included age fixed-effects terms to account for time-fixed differences in the outcomes between age groups.

As mentioned above, the validity of inferences from this analytical method depends on the assumption of parallel trends—i.e. that the difference in our outcomes between treated and control groups would remain constant over time in the absence of the intervention and that any shocks (with the exception of the intervention) would have a similar effect on both treatment and control groups. This assumption is unverifiable and likely to be violated if there are changes in other factors affecting the outcome that coincide with the intervention. To evaluate this assumption, we examined temporal trends in the outcome, comparing treated and control children in the pre-intervention period. To do this, we examined plots of the proportions of children attending school by year for treatment and control groups. We also ran linear regression models of the outcome with treatment group, year and the interaction of treatment and year as covariates, and examined the coefficient of the interaction term to see if it differed significantly from the null.

In our primary analyses, we ran within-country linear regression models of the outcome with the binary treatment variable (being in the affected), an indicator of being in the post-intervention period, an interaction between treatment and being in the post-intervention period, gender, wealth, fixed effects terms for age and fixed effects terms for year as covariates. We assessed the effect of increasing the LMAW on

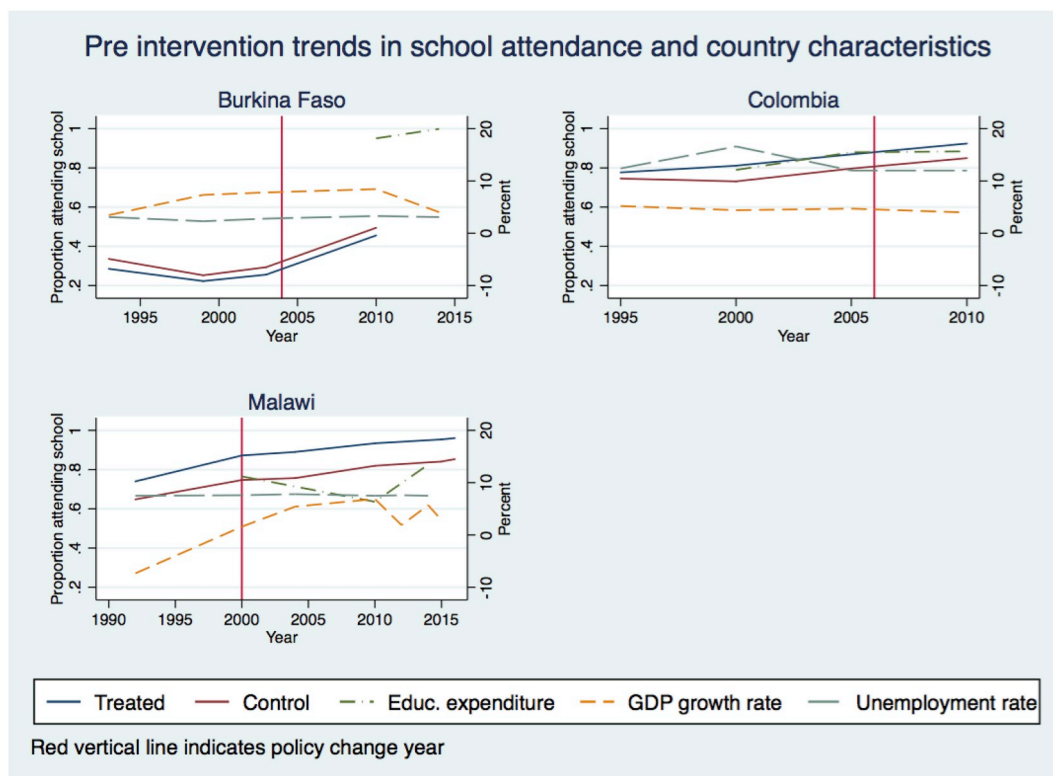


Fig. 1. Trends in school attendance and other socio-economic factors by treatment, country and year.

school attendance as the absolute change in the proportion of children who attended school in the year preceding the survey year, comparing treated and control age groups from the pre-to the post-intervention periods.

The general model specification was:

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 X_i + \beta_3 X_i * T_i + \beta_4 C_i' + \beta_5 age_i' + \beta_6 year_i' + \epsilon_{it}$$

Here,  $Y_{it}$  is the outcome for individual  $i$ ;  $X$  is an indicator of being in an age group affected by the policy. The terms  $age_i'$  and  $year_i'$  represent the age and survey year fixed effects terms, respectively. Covariates included in the vector  $C_i'$  were household wealth and child's gender as categorical variables. The coefficient of the interaction term,  $\beta_3$ , is the DiD estimator in this model.

We explored heterogeneity of the policy effect by gender and socio-economic position by including interaction terms between these potential effect measure modifiers and treatment, pre-post indicator, interaction term, age, and year. From these models, we estimated the impact of the policy change within categories of gender and household wealth, for each outcome.

We weighted all regression models with de-normalized sample weights as per the DHS recommended method and accounted for clustering at the level of the primary sampling unit for each survey (Rutstein & Rojas, 2006). We used population estimates from the Population Division of the United Nations Department of Economic and Social Affairs to generate the de-normalized sample weights as per the DHS recommended method (United Nations: Department of Social and Economic Affairs, 2013). All analyses were conducted in STATA 13 (StataCorp, 2013).

### 3. Results and discussion

The average age of children in our study was 13.5 years in Burkina Faso, 13.9 years in Colombia and 13.5 years in Malawi. Approximately 50% of each sample was male. The countries in this study differed in their school attendance rates across the study period. Only 36% of children in Burkina Faso attended school in the year prior to each

**Table 2**  
Sample characteristics by country and survey year.

Country	Treated		Attended school		Missing		Total
	N	%	n	%	N	%	
<b>Burkina Faso</b>							
1993	1637	21.3	2481	32.3	54	0.7	7683
1999	1486	20.2	1795	24.4	58	0.8	7349
2003	2987	21.4	3981	28.5	0	0	13950
2010	3401	19.3	8576	48.7	0	0	17611
Total	9511	20.4	16833	36.1	112	0.2	46593
<b>Malawi</b>							
1992	1646	27.7	3989	67.2	13	0.2	5935
2000	3618	26	10811	77.7	38	0.3	13905
2004	3583	27	10525	79.3	0	0	13280
2010	7296	26.5	23335	84.8	58	0.2	27515
2015	5448	27	17614	87.1	0	0	20212
2016	2487	26.8	8193	88.2	0	0	9290
Total	24078	26.7	74467	82.6	109	0.1	90137
<b>Colombia</b>							
1995	1057	11.6	6757	74.5	60	0.7	9075
2000	993	11.2	6553	73.8	27	0.3	8879
2005	3497	11.5	24555	80.5	0	0	30508
2010	4507	11.7	33126	85.8	0	0	38591
Total	10054	11.5	70991	81.5	87	0.1	87053

survey, compared to more than 80% of children in Colombia and Malawi. As seen in Fig. 1 the proportion of children attending school generally increased in all countries over the study period. The pattern of increase suggests that pre-intervention trends in the outcome were parallel for treated and control groups in all countries included in our analyses (See Fig. 2 and Fig. 3). This is supported by the fact that the coefficients of the interaction terms between treatment status and the year dummy variables in our pre-intervention models were essentially null. Table 1 gives some background information on economic, educational and social contexts in these countries. Details of the surveys we

**Table 1**  
Economic, educational and social contexts of study countries.

Sources: All education and educational expenditure data are from the UNESCO Institute for Statistics (<http://uis.unesco.org/>). All economic indices are from World Bank national accounts data, and OECD National Accounts data files. All employment indices are from the International Labour Organization, ILOSTAT database. Data retrieved in November 2018. All child labor indices are from the International Labour Organization, ILOSTAT database. Data retrieved in November 2018.

	Burkina Faso			Colombia			Malawi		
	2000	2005	2010	2000	2005	2010	2000	2005	2010
Adjusted net enrollment rate, primary (% of primary school age children)	36.7	46.0	60.2	97.5	97.5	97.2	-	96.7	-
Adjusted net enrollment rate, primary, female (% of primary school age children)	30.4	40.7	57.7	97.5	97.7	97.0	-	98.4	-
Adjusted net enrollment rate, primary, male (% of primary school age children)	42.9	51.1	62.6	97.5	97.2	97.4	-	95.0	-
School enrollment, secondary (% net)	-	11.4	16.5	-	64.1	78.8	29.6	22.3	27.5
Adolescents out of school (% of lower secondary school age)	-	80.6	54.1	-	12.8	0.6	-	34.8	-
Children out of school (% of primary school age)	63.3	54.0	39.8	2.5	2.5	2.8	-	3.3	-
Government expenditure on education, total (% of GDP)	-	4.4	3.9	3.5	4.0	4.8	5.2	-	3.5
Government expenditure on education, total (% of government expenditure)	-	19.5	16.2	13.3	15.5	16.4	-	-	12.5
Government expenditure per student, primary (% of GDP per capita)	-	33.3	18.1	12.1	15.5	15.7	11.4	-	5.1
Government expenditure per student, secondary (% of GDP per capita)	-	20.8	20.6	13.1	14.5	15.2	25.5	-	15.0
Expenditure on primary education (% of government expenditure on education)	-	71.2	60.3	44.6	47.4	35.9	52.8	-	34.8
Expenditure on secondary education (% of government expenditure on education)	-	10.3	18.0	33.1	36.1	34.8	21.4	-	24.1
Expenditure on tertiary education (% of government expenditure on education)	-	9.6	18.8	19.9	13.8	22.1	15.6	-	29.8
GDP growth (annual %)	1.8	8.7	5.4	2.9	4.7	4.3	1.6	3.3	6.9
GDP per capita (constant 2010 US\$)	434.8	512.0	575.4	4764.7	5312.7	6230.7	384.7	373.2	458.9
Poverty gap at \$1.90 a day (2011 PPP) (%)	-	-	-	11.0	3.3	2.9	-	-	34.0
Unemployment, total (% of total labor force) (modeled ILO estimate)	2.6	4.0	4.7	20.5	11.9	10.9	7.7	7.8	6.7



**Table 3**

Effect of policy change on school attendance. Results presented as percentage-point change (95% confidence intervals). Values represent the absolute change in proportion of age-qualified students attending school in the academic year before being surveyed.

Country	Burkina Faso	Colombia	Malawi
<b>All children</b>	-0.22 [-2.38, 1.95]	2.04 [0.34, 3.74]	2.99 [0.22, 5.76]
<b>By gender</b>			
Boys	-0.59 [-3.79, 2.6]	2.19 [-0.34, 4.72]	1.49 [-2.79, 5.77]
Girls	0.34 [-2.81, 3.48]	1.94 [-0.29, 4.18]	4.44 [0.43, 8.45]
Heterogeneity p-value	< 0.01	0.17	0.05
<b>By wealth</b>			
Poorest	-2.67 [-6.10, 0.75]	6.66 [2.6, 10.72]	2.8 [-2.47, 8.07]
Middle	1.14 [-2.84, 5.12]	2.72 [-0.42, 5.85]	5.57 [0.63, 10.52]
Richest	2.02 [-2.01, 6.04]	-1.82 [-3.5, -0.14]	0.86 [-3.49, 5.2]
Heterogeneity p-value	0.32	< 0.01	0.08

used, and their sample sizes are given in Table 2 below. In Table 4, we provide details of relevant policy changes in each country (see Fig. 2).

We present the results of our main analyses in Table 3. Increasing the LMAW was associated with an increase of 2.0 (0.3, 3.7) percentage-points in school attendance in Colombia. Similarly, the proportion of Malawian children remaining in school increased by 3.0 (0.2, 5.7) percentage-points. We found no evidence that the change in policy in Burkina Faso had an effect on school attendance.

In Malawi, increasing the LMAW was associated with a 4.4 (0.4, 8.5) percentage-point increase in school attendance among girls, however there was no change in attendance among boys. There was no difference in the effect of intervention on school attendance by gender in any of the other countries. In Colombia, the policy-change increased school attendance among the poorest tercile by 6.6 (2.6, 10.7) percentage-points while it decreased attendance by 1.8 (0.1, 3.5) percentage-points among the richest tercile. In Malawi, the middle wealth tercile saw a 5.6 (0.6, 10.5) percentage-point increase in school attendance. The other wealth categories saw no effect of the policy. The effect of school attendance did not vary by gender in the other countries.

We found that increasing the LMAW increased school attendance in Colombia and Malawi but had no effect in Burkina Faso. In this respect, our results differ from those of Boockmann (Boockmann, 2010), who found no evidence of a difference in school attendance between countries who had ratified ILO convention 138 and those who had not (by 1990), and that age groups protected from work under ILO convention 138 were no more likely to attend school than those not affected by it. Our findings are consistent with and deepen the cross-sectional results by Heymann et al. examining the associational relationship between child labor laws and secondary education rates at a national level (Heymann et al., 2013). This finding affirms the need for international conventions to be translated into national policy in order to have effect.

The effect of such national policy depends on local socio-economic conditions. Burkina Faso, whose policy had no effect on school attendance, suffers from high levels of poverty, and poor-quality educational infrastructure due to chronic underinvestment in education. These conditions impede the effective implementation of any educational or labor policy. This reflects in the fact that, while basic education in Burkina Faso is ostensibly free and compulsory, fewer than 30% of children complete primary school (EPDC, 2014) and also, in spite of the restrictions on child work, about 40% of 5–14 year-olds still work (USDOL, 2016c).

Our findings support the importance of adequately-resourced enforcement mechanisms and regulatory capacity of for LMAW

restrictions to be effective. Malawi and Colombia, which saw positive effects of their child labor policies on school attendance were ranked 54<sup>th</sup> and 80<sup>th</sup> respectively out of 113 countries in regulatory enforcement, while Burkina Faso, which saw no effect is ranked 94<sup>th</sup>. Institutional enforcement capacity is more difficult to measure and tends to vary over time. Child labor regulatory bodies are however generally under-resourced: in 2016 Colombia deployed 836 labour inspectors for a labour force size of 26 million people, while Burkina Faso had 154 for 6.8 million and Malawi 141 for 8.8 million (USDOL, 2016b).

LMAW restrictions are often impeded in their effectiveness by the fact that children mostly work in the informal economy, which tends to resist regulation through formal mechanisms such as legal reform. This notion is supported by a comparison of the relative sizes of the informal economy in Colombia and Malawi (60.6% and 83% of the workforce respectively) to that in Burkina Faso (94.6%) (International Labour Office, 2018).

The magnitude of change proposed by the legal reforms in each country may also have affected the observed impact. Malawi, which made the biggest change in its policy (the LMAW went from none to 14), also saw the biggest impact. The effect of policy in Colombia may have been limited by the fact that school attendance rates were already quite high and thus could only rise minimally in response to the policy.

We found interestingly that the effect of the policy change on school attendance was much greater among girls than boys in Malawi. This could be due in part to socio-cultural changes placing greater value on the education of girls (Coulombe & Canagarajah, 1999; Emerson & Souza, 2007).

Household wealth is one of the strongest predictors of child work and also a driver of educational outcomes (Bhalotra & Heady, 2003; Carpio & Loayza, 2012; Deb & Rosati, 2002). It is possible that the poorest in society would be the most affected by any intervention that restricts child work since they are more likely to have children working. It is also possible that the near-poor would be most affected, if the poorest families are unable to forego child labor even when it is illegal. We found that school attendance increased most for the poorest in Colombia, a middle-income country, and the middle third in Malawi, a low-income country. This difference may be due to family income needs, different levels of enforcement and/or disparate sizes of the informal economy.

It is worth noting that the successful limitation of legal work for children, while benefitting education where there is compliance, may deprive working children of legal protections where illegal child labor

**Table 4**  
Details of policy changes in countries studied.

	Regular Work		Light Work		Laws	Free/compulsory education age	Primary education age
	Year of change	Details of change	Year of change	Details of change			
Burkina Faso	2004	Minimum age changed from 14 to 15	No change	No change	Labour Code 1994 Labour Code 2004 Order No. 545/IGTILS/HV of 2 August 1954 derogating from the age of admission to employment.	6–16	6–13
	2008	Minimum age changed from 15 to 16	2008	Minimum age for light work changed from 12 to 13	Labour Code 2008 Order No. 2008-027/MTSS/SG/DGSST of 26 December 2008 derogating from the age of admission to employment.		
Colombia	2006	Minimum age changed from 14 to 15	2006	Minimum age changed from 12 to 15	Decree 2737 of 1989 Law 1098 issuing Code of Childhood and Adolescence 2006 (entry into force 2007)	5–15	5–10
Malawi	2000	Minimum age changed from 12 with exceptions to 14 with exceptions	No change	No change	Employment of Women and Children 1939 (as amended to 1968) Employment Act 2000	6–14	6–14

continues. The elasticity of supply of child labor may depend on whether adult wages rise when child labor is eliminated or whether governments provide more support to families in poverty as many poor families are forced by economic considerations to choose the immediate economic returns from a child working over the potentially higher future economic returns from sending him/her to school (Carpio & Loayza, 2012; Deb & Rosati, 2002; Bharadwaj, Lakdawala, & Li, 2013; Fontana & Grugel, 2015).

Our study is limited by the nature of our data. Child workers, like other disadvantaged populations, are notoriously difficult to capture in the context of a research study like this. Working children are often from the lowest socio-economic strata, especially in developing countries, and mostly work in informal settings. The work they do is not always entirely legal, and they may be subject to exploitation. Thus, child workers and their employers often avoid scrutiny, hampering any efforts to gather accurate data on them. As a result, national surveys, like the ones used, can provide the best data available. These surveys are limited by self-reported outcomes and thus our study suffers from the limitations associated with both these approaches. This limitation is mitigated by good recall on major activities such as child labor and attending school.

The difference-in-differences method used in this study accounts for time-fixed confounders, both measured and unmeasured. It however does not account for time-varying confounding, which could introduce bias in the estimation of treatment effects if other changes occurred that differentially affected some age groups (Lechner, 2011). By choosing a within-country as opposed to cross-country analytical approach, we hope to have mitigated the degree of time-varying confounding due to country-specific factors.

Despite these limitations, our study benefited from the use of data with multiple time-points allowing us to capture pre- and post-intervention trends in greater detail as well as account for secular trends. These strengthen our confidence in our inferences and conclusions from the data.

In addition, this study benefited from the standardized intervention definitions provided in the McGill PROSPERED Project's Child Labor Policy Database.

### 3.1. Conclusion

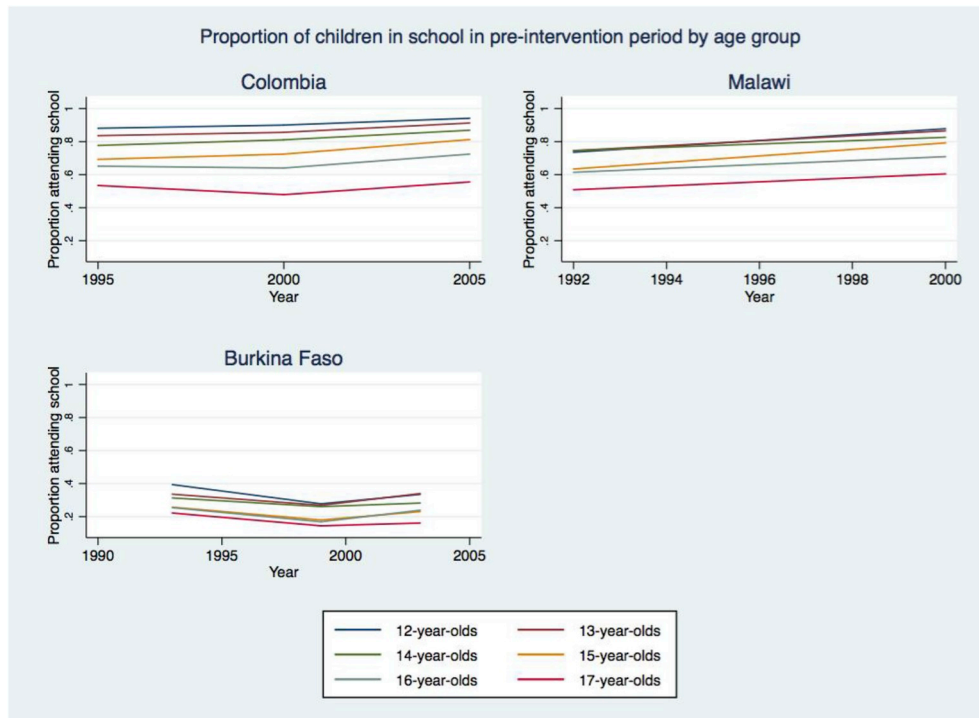
We found evidence that increasing the minimum legal age of child work had a positive effect on school attendance in 2 out of 3 countries. Moreover, children at greater risk of being out of school tended to benefit more. The International Labor Organization, ILO, and its partners in their quest to eliminate child labor have pushed for countries to enact legislation to limit child work even in the face of local opposition (Fontana & Grugel, 2015). The results of this study suggest that in addition to changing the LMAW, consideration must also be given to providing effective implementation mechanisms for such legislation, improving the socio-economic circumstances of poor households, and improving access to, and quality of education.

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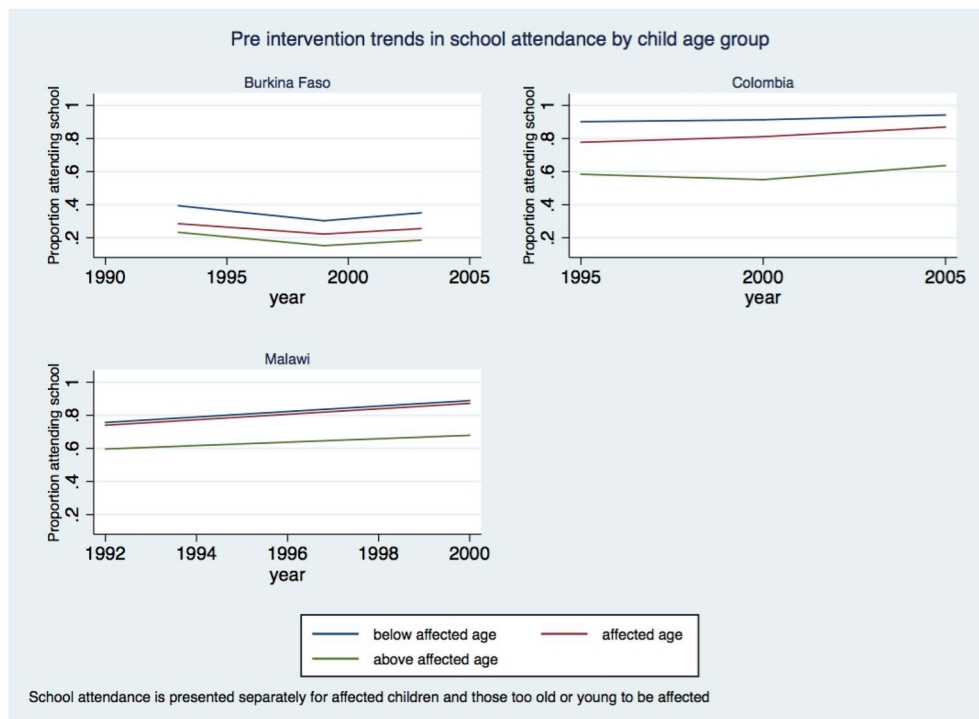
**Appendix**

*Pre-intervention trends in school attendance by individual ages*



**Fig. 2.** Pre-intervention trends in school attendance by age and country.

*Pre-intervention trends in school attendance reported separately for affected ages, ages above affected age and ages below affected age*



**Fig. 3.** Pre-intervention trends in school attendance by control group. 2



## Results for sensitivity analyses comparing different age ranges

Table 5

Effect of policy change on school attendance comparing different age ranges

Results presented as percentage-point change (95% confidence intervals). Values represent the absolute change in proportion of age-qualified students attending school in the academic year before being surveyed.

Country	Burkina Faso		Colombia		Malawi	
	Age 12–17 years	Age 10–18 years	Age 12–17 years	Age 10–18 years	Age 12–17 years	Age 10–18 years
<b>All children</b>	−0.13 [−2.30, 2.03]	−0.22 [−2.38, 1.95]	1.97 [0.27, 3.67]	2.04 [0.34, 3.74]	3.00 [0.25, 5.75]	2.99 [0.22, 5.76]
<b>By gender</b>						
Boys	−0.46 [−3.62, 2.70]	−0.59 [−3.79, 2.6]	2.07 [−0.45, 4.60]	2.19 [−0.34, 4.72]	1.42 [−2.83, 5.68]	1.49 [−2.79, 5.77]
Girls	0.37 [−2.70, 3.49]	0.34 [−2.81, 3.48]	1.89 [−0.33, 4.10]	1.94 [−0.29, 4.18]	4.53 [0.51, 8.54]	4.44 [0.43, 8.45]

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2019.100426>.

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