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Do inclusive education laws improve primary schooling among children with disabilities?*

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ABSTRACT

Of the approximately 93 million children with moderate or severe disabilities around the world, large numbers do not have access to quality education. Inclusive education systems have been advocated as a solution to this problem. In this paper, we examine whether legislation to advance inclusive education can increase the likelihood of children with disabilities attending school in a low-income country. Using a difference-in-difference methodology, we find that children with visual, hearing, and physical disabilities, who began school at a time when inclusive education was guaranteed in Uganda, had a significantly higher likelihood of going to school than children with disabilities in comparator countries in Sub-Saharan Africa, as well as children with disabilities in Uganda who became of school age prior to the passage of legislation. However, this was no longer true when considering only the sample of children reported to have no ability to see, hear, or engage in physical activities. While our findings are promising, comparable data on more countries are needed to comprehensively examine the impact of similar legislation across multiple settings.

1. Introduction

Conservative estimates suggest that globally, about 93 million children under 15 years old are living with some form of moderate or severe disability (United Nations Children's Fund, 2013). Studies have shown that children with disabilities are less likely to attend school than their peers without disabilities (Filmer, 2008; UNESCO, 2018). Compared to people without disabilities, children with disabilities have lower schooling participation and attendance (Filmer, 2008; Lamichhane and Kawakatsu, 2015; Mizunoya et al., 2018) and lower primary, secondary, and higher education completion rates; adults with disabilities have lower rates of literacy (United Nations, 2018). And in turn, the lower access to quality education contributes, together with discrimination and lack of reasonable accommodation (Harlan and Robert, 1998; Kaye et al., 2011; Louvet, 2007; Waddington and Hendriks, 2002), to higher rates of unemployment and lower income as adults (Hoogeveen and Bank, 2005; Lamichhane and Sawada, 2013; Mitra et al., 2013; Mizunoya and Mitra, 2013; Palmer et al., 2012).

The low rates of school participation for children with disabilities reflect the many barriers in education that they face. Negative societal attitudes surrounding disabilities contribute to children with disabilities being out of school (Baffoe, 2013; Green, 2014; Weiserbs and Gottlieb, 2000). Children with disabilities are frequently discriminated against in school admissions. Data from seven countries around 2011 show that 13% of persons with disabilities have been refused entry into a school or preschool at least once because of their disability (United Nations, 2018). Once at school, children with disabilities often encounter inaccessible environments, including communication barriers, the absence of suitable transportation, and the lack of assistive technologies. For example, a study using crowdsourced data indicates that only 47% of more than 30,000 education facilities in most advanced countries are accessible for persons using wheelchairs (United Nations, 2018).

Although the right to education for all has been recognized in several international instruments, starting with the Universal Declaration of Human Rights of 1948, the Salamanca Statement and Framework for Action in 1994 was the first to call for inclusive education. The guidelines, signed by 92 governments, stated that all educational policies "should stipulate that a child with a disability should attend the neighborhood school that is, the school that would be attended if the child did not have a disability." This statement reflected the emerging trend of opposition to segregated educational systems for children with disabilities, in which children are allocated to special schools based on their specific disabilities (Armstrong et al., 2010).

Inclusive education requires that children with disabilities attend the same age-appropriate classes as children without disabilities in local

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schools, and that they are supported by accommodations. In 2006, the Convention on the Rights of Persons with Disabilities (CRPD) was the first international instrument to guarantee an inclusive system of education at all levels. Article 24 of the CRPD calls upon ratifiers to commit to: (a) the provision of free and compulsory education, (b) access to education for children with disabilities "on an equal basis with others in the communities in which they live," (c) reasonable accommodation based on the needs of the children with disabilities, (d) additional support "to facilitate their effective education," and (e) other individualized measures as required by the children. This right has been re-iterated with the most recent call for "inclusive and quality education for all" in the Sustainable Development Goals (SDGs) of 2015.

Beyond the fundamental human right to inclusion, studies have shown that inclusive education has positive effects on the academic achievements of children with disabilities, relative to their peers in special education settings (Jepma, 2003; Markussen, 2004; Myklebust, 2007; Peetsma et al., 2001; Rea et al., 2002). Using longitudinal Dutch cohort data, Peetsma et al. (2001) found that second-graders with disabilities in regular schools scored higher in math after two years and were better in language and math after four years than those in special schools. The positive findings were re-affirmed by Jepma (2003). Markussen (2004) and Myklebust (2007) demonstrated that inclusive classes increased the chances of success in and completion of higher levels of schooling when compared to special classes in Norway. Some studies found no significant differences in the academic outcomes of children with disabilities in inclusive and non-inclusive systems (Cole et al., 2004; Fore et al., 2008; Karsten et al., 2001); however, rarely have negative effects been found.

Despite the greater evidence in favor of inclusive education, it is difficult to draw clear-cut conclusions on whether inclusive education works from the existing research. First, the studies often focused on children with specific types and/or degrees of disability. Rafferty et al. (2003) found that an inclusive setting mattered for the language development of students with severe disabilities but not for those with mild disabilities; Waldron and McLeskey (1998) found greater gains in reading for students with mild learning disabilities than for students with severe disabilities. Second, there were variances in the inclusive designs that were examined, and the results of studies comparing the extent of inclusions ranged widely (Freeman and Alkin, 2000; Markussen, 2004; Ruijs et al., 2010). Finally, many of the studies in this area suffered from limitations such as small sample sizes, lack of randomization, and absence of matched control groups, making it necessary to exercise caution when interpreting and comparing the results (Lindsay, 2007; Ruijs and Peetsma, 2009; Salend and Garrick Duhaney, 1999).

More importantly, there is a lack of research on whether making education inclusive works at scale. Except for the two studies (Markussen, 2004; Myklebust, 2007) of a 1994 reform in Norway that provided all 16-year-old children, including children with special needs, the right to enter upper secondary school, all other studies cited here examined school- or class-level inclusion programs. The data collected from these programs also limit the analyses to academic outcomes such as test scores and attendance, without any studies on whether inclusive education policies or programs increase school participation of children with disabilities at the extensive margin. Further, we were unable to find any rigorous quantitative studies on inclusive education policies in low- and middle-income countries. To our knowledge, this is the first study to examine whether inclusive education legislation is positively associated with the participation of children with disabilities in primary schools in a low-income country.

In this study, we estimate the impact of an inclusive education law on the likelihood of children with visual, hearing, and physical disabilities attending primary school in the Sub-Saharan country of Uganda. To rigorously examine whether the legislation had an impact, we compared the change in schooling outcome of children with disabilities, aged 5–9, in Uganda before and after the policy, with the change in outcome for similar children in two like Sub-Saharan African countries, Chad and Ghana. We find that children with disabilities in Uganda are associated with a greater likelihood of attending school, relative to children in countries without similar laws.

It is important to note that many low- and middle-income countries have adopted inclusive education laws (WORLD, 2019); the main reason for the shortage of studies on this topic is the absence of internationally comparable quality data on disabilities across countries. Several countries have been collecting disability-related data for years but without using any standardized definition or classification of disabilities. This is especially challenging when examining the effect of national-level laws and policies where comparison across countries is crucial. Although there have been attempts to systematize disability data collection following the International Seminar on the Measurement of Disability in 2001, these are too recent to provide us with comparable longitudinal data. By judiciously choosing surveys over time and across countries, along with the use of robust empirical methods, we provide evidence to support the adoption and implementation of inclusive education laws worldwide.

2. Methods

2.1. Data

We examine the effect of inclusive education laws and policies on the schooling of children with disabilities in Sub-Saharan Africa. On reviewing household surveys from all countries in the region, we identified five countries with data on disability and educational status of children. Educational data in these five countries were collected before and after an inclusive education law was passed (treatment countries) or at two similar time periods when no inclusive educational law was passed (control countries). These countries were Chad, Ghana, Malawi, Sierra Leone, and Uganda. We used data from three of these countries in our analysis: Chad, Ghana, and Uganda. Sierra Leone and Malawi were excluded from the study because of a very small sample of children with disabilities in Sierra Leone and highly unstable estimates of disability prevalence over time in Malawi, both of which raised concerns about quality of data on disabilities. We used data from three nationally representative household surveys: the Demographic Health Surveys (DHS), the Multiple Indicator Cluster Surveys (MICS), and the Living Standard Measurement Study (LSMS). Each survey interviews a stratified random sample of households on a wide range of socio-economic issues, including demographic characteristics, education, and health.

The use of multiple surveys was necessary to have data on sufficient countries and years to make it possible to carry out a difference-in-difference estimation. The strength of a difference-in-difference model is that we can attribute the observed changes in an outcome to the policy reform in question by comparing the outcomes of the groups with and without exposure to a policy (treatment and control groups) at different periods in time.

We took several steps to increase comparability across surveys. First, we focused only on visual, hearing, and physical disabilities, despite the availability of information on other types of disabilities. Second, we used two approaches to compare data from surveys with a "yes–no" question to those with a scale. We first classified children with "a lot of difficulty" or "cannot do [activity] at all" as having a disability as it is reasonable to assume that the children with the most severe forms of disability will be identified in all surveys. We then checked the robustness of our results by varying this classification. Third, we carried out sensitivity analyses by focusing on different groups of children with disabilities in case some are more systematically captured. The exact wording of the questions in each survey is presented in Table 1.

Our final sample included children with disabilities aged 5–9 years. We examined the educational experiences of children who had a visual, hearing, or physical disability as reported by the children or the

Table 1
Questions used in each survey.

Country	Year survey	Questions on		
		Vision	Hearing	Physical
Chad	2004 DHS	Is there anyone in your household who does not see much or who is blind? Does [NAME] only have difficulty seeing or is [NAME] completely blind? 1 = partial impairment 2 = total blindness	Is there anyone in your household who does not hear much or who is deaf? Does [NAME] only have difficulty hearing or is [NAME] completely deaf? 1 = partial impairment 2 = total deafness	Does [NAME] in your household suffer from dismemberment? Does [NAME] in your household have lost limbs?
Chad	2014 DHS[a]	Is there anyone in your household who does not see or who is blind? Does [NAME] only have difficulty seeing or is [NAME] blind? 1 = partial impairment 2 = total blindness	Is there anyone in your household who does not hear much or who is deaf? Does [NAME] only have difficulty hearing or is [NAME] completely deaf? 1 = partial impairment 2 = total deafness	Is there anyone in your household who suffers from deformity of the upper or lower limbs and cannot or has difficulty walking and / or using his arms or hands? Does [NAME] only have difficulty using his arms or legs, or can [NAME] not use his arms or legs at all? 1 = partial impairment 2 = total impairment
Ghana	1993 DHS	Does [NAME] have difficulty seeing?	Does [NAME] have difficulty hearing/ speaking?	Does [NAME] have difficulty moving? Does [NAME] have loss of feeling in hand/ foot?
Ghana	2006 MICS	Compared with other children, does [NAME] have difficulty seeing, either in the daytime or at night?	Does [NAME] appear to have difficulty hearing?	Does [NAME] have difficulty in walking or moving his/her arms or does he/she have weakness and/or stiffness in the arms or legs?
Uganda	2005 LSMS[b]	Which condition best describes the difficulty you have? 1 = Poor Vision 2 = Blindness	Which condition best describes the difficulty you have? 1 = Hearing difficulty 2 = Deafness	Which condition best describes the difficulty you have? 1 = Limited use of legs, feet 2 = No leg(s), feet
Uganda	2009–10 LSMS	Does [NAME] have difficulty seeing, even if he/she is wearing glasses? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot see at all	Does [NAME] have difficulty hearing, even if he/she is wearing a hearing aid? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot hear at all	Does [NAME] have difficulty walking or climbing steps? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot walk at all
Uganda	2010–11 LSMS	Does [NAME] have difficulty seeing, even if he/she is wearing glasses? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot see at all	Does [NAME] have difficulty hearing, even if he/she is wearing a hearing aid? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot hear at all	Does [NAME] have difficulty walking or climbing steps? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot walk at all
Uganda	2016 DHS[c]	Does [NAME] have difficulty seeing, even if he/she is wearing glasses/contact lenses? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot see at all	Does [NAME] have difficulty hearing, even if he/she is wearing a hearing aid OR without a hearing aid? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot hear at all	Does [NAME] have difficulty walking or climbing steps? 1 = No – no difficulty 2 = Yes – some difficulty 3 = Yes – a lot of difficulty 4 = Cannot walk at all

[a] DHS 2014 contains additional questions on the lack of body parts but we ignore this question because there is no information on the exact body part.
[b] LSMS 2005 has information on whether there is limited use or absence of arms/hands. For consistency with the other years of data in Uganda, we do not consider this question when identifying children with physical disabilities.
[c] DHS 2016 has separate questions on whether an individual has seeing or hearing difficulties when he/she does not wear glasses/contact lenses and does not use a hearing aid, respectively. For consistency with the earlier two years of data from the LSMS, we do not consider this question when identifying children with disabilities.

household head during the interview. The three surveys did not consistently collect both educational and disability data on older children and youth.[1] The prevalence of disability among children in the three countries is reported in Table 2. The percentage of children aged 5–9 years with a reported visual or hearing disability has declined over time in Chad and Uganda. There has been an increase in the prevalence of physical disabilities in Chad, and the overall disability prevalence among children has increased in Ghana.

In addition to the disability data, the surveys contain information on whether children were attending school in the year of the survey. This is the outcome variable of interest in our study. The term "school" encompasses all formal schooling, including pre-primary and primary levels, in the three surveys employed in this analysis. The surveys also have additional individual- and household-level data, including gender and age of the child, relationship of the child to the household head, the education level of the head, the family size, and place of residence. All these variables serve as controls for our regressions. We supplement the data with the International Wealth Index (IWI), a wealth index that is comparable across surveys (Smits and Steendijk, 2015). This household-level index, which indicates the extent to which a household owns assets that are valued worldwide, solves the problem arising when using multiple surveys, each of which typically constructs wealth indices based on assets available in the data. The control variables are described in Appendix 1. On excluding children with missing data on educational status, disability status, and the set of explanatory

[1] The three surveys ask the disability and education questions to individuals of varying ages. The difficulty-related questions were asked for children aged 5 years or older in the LSMS and DHS, while they were restricted to children aged 2–9 years in the MICS. The education questions were asked for children 5 years and above in all three surveys. The age range (5–9 years) used in this paper is based on the overlap between the ages of children covered in the education and disability sections of the three surveys.

Table 2
Prevalence of disabilities among children aged 5–9 years.

			Types of disabilities						
			Vision, hearing, or physical	Vision or hearing	Vision or physical	Hearing or physical	Vision	Hearing	Physical
Uganda	Children with disabilities	2005	86	69	37	67	20	50	17
		2009	23	19	12	18	7	14	7
		2010	24	17	12	21	5	14	8
		2016	65	3	64	63	2	1	62
	Disability prevalence	2005	3.25	2.62	1.42	2.55	0.77	1.91	0.66
		2009	0.85	0.70	0.44	0.66	0.26	0.52	0.26
		2010	0.95	0.67	0.48	0.83	0.20	0.55	0.32
		2016	0.42	1.18	0.41	0.40	2.20	0.59	0.40
Chad	Children with disabilities	2004	68	58	24	54	14	44	10
		2014	165	112	84	137	29	83	56
	Disability prevalence	2004	1.34	1.14	0.47	1.06	0.27	0.86	0.20
		2014	1.27	0.87	0.65	1.06	0.24	0.66	0.45
Ghana	Children with disabilities	1993	64	38	43	48	17	21	27
		2006	205	148	143	144	84	83	68
	Disability prevalence	1993	1.77	1.05	1.19	1.33	0.47	0.58	0.75
		2006	5.31	3.83	3.70	3.73	2.18	2.15	1.76

Note: Reported disability prevalence is in percentages.

variables, we ended up with a sample size of 618 children with disabilities.

The policy data for the three countries—Chad, Ghana, and Uganda—come from the WORLD Policy Analysis Center (WORLD). WORLD's database contains details of inclusive education policies and laws as of 2017 in each country, along with the year of adoption. The database was primarily constructed from national legislation accessible via the United Nations Educational, Scientific and Cultural Organization's (UNESCO) Observatory on the Right to Education. Official country documents, as well as country reports submitted to the Committee on the Rights of Persons with Disabilities, were also consulted to verify the accuracy of the policy data. The laws and policies of each country were independently coded by two research analysts before comparing and reconciling any differences. Systematic quality checks were undertaken to ensure the integrity of the data.

Any disability-, education-, or child protection-specific legislation that guaranteed integration of children with disabilities in mainstream schooling environments was identified as inclusive education legislation. Such legislation also listed the kinds of accommodations that were necessary to assist children with disabilities. Laws that merely mentioned integration in the larger school system were not considered inclusive as these could include separate or segregated schools within the same school system.

Of the three countries in our study, Uganda is the sole country to have adopted inclusive education legislation during the period for which disability data are available. The Ugandan Persons with Disability Act of 2006 states that the government shall "promote the educational development of persons with disabilities through— (a) encouragement of inclusive education […]." The legislation also clearly outlines the requirements of assistive devices, structural and other adaptations of educational institutions, and assistive services during examinations. Chad and Ghana serve as control countries in our analysis. Chad does not explicitly guarantee the inclusion or accommodation for children with disabilities in schools. Ghana adopted legislation similar to that of Uganda after the most recent survey with disability data in the country.

Country-level data, obtained from the World Development Indicators, included the gross domestic product (GDP) per capita, student–teacher ratio in primary school, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population. We used simple imputation to fill in the missing data for expenditure on primary education. All relevant variables used constant 2011 dollars.

2.2. Analysis

To estimate the causal effect of the Ugandan inclusive education policy on the school participation of children with disabilities, we compare the outcome for children with disabilities in Uganda (treatment country) before and after exposure to the policy, and then compare the change with the corresponding changes for children with disabilities in Chad and Ghana, where inclusive education policies did not exist (control countries).

This empirical strategy is known as the difference-in-difference (DD) method. Only examining the experiences of children with disabilities before and after the policy change in Uganda does not account for other factors that have changed over time while comparing children across countries at a point in time is also insufficient. The DD method combines comparisons both across time and countries to "produce a better estimate of the counterfactual" (Gertler et al., 2016) and can be implemented by estimating the following equation:

$$y_{ict} = \beta_0 + \beta_1 exposure_{ct} + \beta_2 X_{ict} + \beta_3 H_{ict} + \beta_4 Z_{ct} + \delta_c + \delta_t + \varepsilon_{ict}$$

where y_{ict} is an indicator for whether child i living in country c in year t was attending school at the time of the survey. The $exposure_{ct}$ variable equals 1 if a child with a disability (physical, visual, or hearing) was residing in Uganda during a year when the inclusive education law was in effect and zero otherwise. β_1 is the coefficient of interest, and it gives us an estimate of the average effect of exposure to the inclusive education policy on the likelihood of children with disabilities attending school.

The model includes country fixed effects (δ_c) and survey year fixed effects (δ_t) that control for time-invariant country characteristics and for time-specific factors affecting all countries. We also controlled for several observed time-varying characteristics including at the country-level (Z_{ct}), the household-level (H_{ict}), and the individual-level (X_{ict}). We estimated the equation using logistic regression. We computed the standard errors clustered at the country-level (Bertrand et al., 2004).

3. Results

3.1. Main results

Table 3 presents the summary statistics of selected variables for children of ages 5–9 who have been identified as having a visual, hearing, or physical disability. The average age of the children with disabilities in the sample is 7 years, and 43% of them are girls. The majority of the children reported having disabilities are sons or

Table 3
Summary statistics.

	Children with disabilities, ages 5–9				
	Mean	SD	Min	Max	N
Age	7.04	1.39	5.00	9.00	618
Sex	0.43	0.50	0.00	1.00	618
Son/daughter of head	0.82	0.39	0.00	1.00	618
Head: no schooling	0.44	0.50	0.00	1.00	618
Head: primary schooling	0.34	0.48	0.00	1.00	618
Head: secondary or higher schooling	0.22	0.41	0.00	1.00	618
Household size	7.29	3.13	2.00	21.00	618
Number of boys	2.26	1.59	0.00	9.00	618
Number of girls	2.06	1.44	0.00	9.00	618
Rural residence	0.76	0.43	0.00	1.00	618
IWI	25.22	18.74	−9.00	95.12	618
GDP per capita	1971.62	471.00	1222.70	2632.03	618
Population (100,000 s)	213.00	93.48	97.10	415.00	618
Share of urban population	29.44	11.97	16.96	47.99	618
Infant mortality	67.08	15.93	37.00	95.10	618
Ratio of student to teacher	47.41	11.79	30.21	68.72	618
Primary education expenditure	3.43	1.55	1.59	6.02	618

daughters of the household head, 44% of whom have never attended school. These children live in large households with an average size of 7 members. Seventy-six percent of the children in our sample live in rural areas.

It is important to note that there are no significant differences in the mean age of the children with disabilities in the treatment and control countries in the pre-legislation period. Similarly, there are no significant differences in the means of most of the individual- and household-level variables: sex, relationship to head, secondary or higher educational status of the head, household size, number of boys, and girls in the household. In other words, the children with disabilities in the treatment and control countries are similar to each other before the adoption of the legislation, except in terms of place of residence and wealth index. Since these differences can impact our analysis, we control for these variables in our estimation.

Chad and Ghana serve as reasonable control countries as low-/low-middle-income countries from the same region. There is also no significant difference in pre-legislation student–teacher ratios in primary school between the treatment and control countries. Further, Ghana provides a particularly good control as a country that has also passed inclusive education legislation. The period prior to passage serves as a control (data are not yet available on education and children with disabilities for the post-legislation period). Chad provides a control country that has yet to pass any relevant legislation.

We also control for country-level characteristics that may affect children's education, including GDP per capita, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population.

Table 4 reports the estimated odds ratios from the DD analysis. Column 1 indicates that exposure to the inclusive education policy is associated with a 56% increase in the likelihood of Ugandan children with disabilities attending school, relative to similar children in Chad and Ghana. We also find that the children belonging to rural or larger households are significantly less likely to attend school, while children in households with a higher wealth index are significantly more likely to attend school.

We also compared the children with disabilities in Uganda to each of the control countries separately in columns 2 and 3. We find that the Ugandan legislation increased the likelihood of going to school for children with disabilities when compared to their peers in either Chad or Ghana.[2] These individual control country comparisons confirm that the positive association of the inclusive education law with schooling is not dependent on the particular surveys conducted in each country.

Table 4
Estimates.

	1 Entire sample	2 Without Ghana	3 Without Chad
DD estimate	1.561***	3.249***	1.783**
	(0.13)	(1.09)	(0.44)
Age	2.835	1.685	1.289
	(3.88)	(3.30)	(2.94)
Age squared	0.942	0.974	0.979
	(0.07)	(0.11)	(0.14)
Female child	1.013	1.10	1.54
	(0.49)	(0.81)	(0.99)
Son/daughter of head	0.738	0.75	0.635***
	(0.14)	(0.15)	(0.11)
Primary schooling of household head	1.703	1.533	0.894
	(1.21)	(1.65)	(0.87)
Secondary or higher schooling of household head	1.449	1.243	0.87
	(0.81)	(1.00)	(0.85)
Household size	0.916***	0.906***	0.891***
	(0.03)	(0.02)	(0.03)
Number of boys in household	1.108	1.074	1.303***
	(0.16)	(0.19)	(0.02)
Rural	0.646***	0.656***	0.590***
	(0.01)	(0.05)	(0.03)
IWI	1.015***	1.016***	1.015***
	(0.00)	(0.01)	(0.00)
N	618	403	388

Standard errors are in parentheses and are clustered at the country level. All regressions include country fixed effects, year fixed effects, and all control variables. Country-level controls include log of GDP per capita, student–teacher ratio in primary school, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population. Individual- and household-level control variables are reported in the table. IWI is a wealth index that is comparable across surveys. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

3.2. Robustness checks

We conducted several robustness checks to test the validity of the results. First, we re-estimated the regression using different combinations of the three types of disabilities: visual, hearing, or physical disabilities. In Table 4, our sample consisted of children with any of the three disabilities. However, the questions on the different types of disabilities varied across the surveys (see Table 1). For example, the questions on physical disability in Chad asked about limbs or both hands and feet, but the questions in Uganda were restricted to difficulties walking/climbing. To test whether this affected our results, we ran the DD analysis for the sample of children with: (i) only visual or hearing disabilities, (ii) only visual or physical disabilities, and (iii) only hearing and physical disabilities. Columns 1 and 3 in Table 5 continue to show that the inclusive education legislation is significantly and positively associated with an increased likelihood of children with disabilities attending school. Column 2 indicates a positive relationship, but the coefficient is not significant, likely because of the smaller sample size of the children with only visual or physical disabilities.

Second, we re-estimated the regressions after re-categorizing the levels of difficulty that counted as a disability. While some surveys

[2] When comparing children with disabilities in Uganda and Chad, we can include children above the age of 9 years in our analysis, thereby increasing the sample size. We are able to do so because these two countries do not use the MICS data which asks the difficulty-related questions to children aged 2–9 years only. The DD estimate remains unchanged in sign but decreases in magnitude when we rerun the main regression with the larger sample.

Table 5
DD analysis across different types of disability.

	1 Visual or hearing disability	2 Visual or physical disability	3 Hearing or physical disability
DD estimates	4.060***	1.036	1.860***
	(0.97)	(0.10)	(0.04)
Age	1.718	8.478*	2.594
	(2.38)	(9.67)	(4.79)
Age squared	0.976	0.873**	0.946
	(0.07)	(0.06)	(0.11)
Female child	0.747	1.261	1.114
	(0.28)	(0.67)	(0.58)
Son/daughter of head	0.742	0.871	0.713**
	(0.16)	(0.19)	(0.11)
Primary schooling of household head	1.312	1.833	2.059
	(0.90)	(1.18)	(1.56)
Secondary or higher schooling of household head	1.546	1.328	1.619
	(0.83)	(0.84)	(0.85)
Household size	0.920***	0.917***	0.921**
	(0.02)	(0.01)	(0.04)
Number of boys in household	1.075	1.069	1.157
	(0.14)	(0.11)	(0.24)
Rural	0.616***	0.614***	0.684***
	(0.08)	(0.07)	(0.04)
IWI	1.013*	1.028***	1.004
	(0.01)	(0.00)	(0.00)
N	412	369	482

Standard errors are in parentheses and are clustered at the country level. All regressions include country fixed effects, year fixed effects, and all control variables. Country-level controls include log of GDP per capita, student–teacher ratio in primary school, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population. Individual- and household-level control variables are reported in the table. IWI is a wealth index that is comparable across surveys. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

contained a "yes–no" answer to the disability status question, others required detailed answers on the extent of the disability, either on whether the disability was 'partial' versus 'total' or whether an individual had no difficulty, some difficulty, a lot of difficulty or could not do the activity at all. So far, we excluded children with reports of "some difficulty" as having a disability. Column 1 of Table 6 shows the estimated coefficients when we used a laxer definition, including children with any level of difficulty in our sample, and is similar to our main findings. However, when children who were unable to do an activity at all were considered, the inclusive education legislation is significantly and negatively associated with the likelihood of children going to school. This implies that the legislation was unsuccessful in reaching out to children with the most severe disabilities.

Lastly, we re-estimated the regression using a subsample of Ugandan children who reside in districts without special needs schools. Although the Persons with Disability Act in Uganda prioritizes inclusive education, it also provides for separate schools for those with special needs. The Ugandan legislation promotes the twin-track approach by providing for inclusive education as well as "the establishment of special schools and units, where inclusive education is not possible, with curricula designed for different disability conditions" (Disabilities Act and Uganda, 2006). It is, therefore, possible that some of the children in the sample, who were reported as attending school, go to special schools. To examine whether the effect was greater in areas not relying on special schools, we divided the districts in Uganda into two sets—those with special needs schools and those without—by using data on schools receiving subvention grants from a 2011 National Council of Disability report (Lillian and Julius, 2011). Special needs schools

Table 6
DD analysis using different levels of disability.

	1 Any level of disability or difficulty	2 Cannot do an activity at all
DD estimate	1.561***	0.335***
	(0.13)	(0.04)
Age	2.835	7.680***
	(3.88)	(3.51)
Age squared	0.942	0.881***
	(0.07)	(0.02)
Female child	1.013	0.856
	(0.49)	(0.28)
Son/daughter of head	0.738	0.552*
	(0.14)	(0.19)
Primary schooling of household head	1.703	2.587***
	(1.21)	(0.58)
Secondary or higher schooling of household head	1.449	1.487
	(0.81)	(0.88)
Household size	0.916***	0.969*
	(0.03)	(0.02)
Number of boys in household	1.108	1.22
	(0.16)	(0.16)
Rural	0.646***	0.602***
	(0.01)	(0.07)
IWI	1.015***	1.01
	(0.00)	(0.01)
N	618	293

Standard errors are in parentheses and are clustered at the country level. All regressions include country fixed effects, year fixed effects, and all control variables. Country-level controls include log of GDP per capita, student–teacher ratio in primary school, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population. Individual- and household-level control variables are reported in the table. IWI is a wealth index that is comparable across surveys. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

receive a subvention grant that is directly sent to the school accounts from the Department of Special Needs and Inclusive Education. We then ran our estimation on the sub-sample of children with disabilities living in districts without any special needs schools (42% of the sample of children with disabilities in Uganda) and all the children in the control countries. Note that a few special needs schools not registered with the ministry might be included in the districts we classify as having no special school. Column 2 in Table 7 shows that exposure to the inclusive education policy is associated with a greater increase in the likelihood of Ugandan children with disabilities attending school in districts that do not receive any grants for special needs schools, relative to similar children in Chad and Ghana.

4. Discussion

Despite the universal call for legislative and policy action to promote inclusive education, there has been no previous rigorous quantitative examination of the impact of such laws and policies on the educational outcomes of children in lower-income countries. We find that the inclusive education law in Uganda is significantly associated with a 56% increase in the likelihood of children with visual, hearing, and physical disabilities attending school, compared to their peers in Chad and Ghana without similar laws. However, this is no longer true when considering only the sample of children reported to have no ability to see, hear, or engage in physical activities. By focusing on districts that do not receive grants for special needs schools, our findings also indicate that the estimated positive association of the inclusive education legislation in Uganda and the school participation of children with disabilities is not driven by the presence of separate schools in the country.

Table 7
Using children with disabilities in Ugandan districts without special needs schools.

	1 Entire sample	2 Sample of children in districts without special needs schools
DD estimate	1.561***	1.849***
	(0.13)	(−0.06)
Age	2.835	4.484
	(3.88)	(−6.42)
Age squared	0.942	0.924
	(0.07)	(−0.08)
Female child	1.013	0.652***
	(0.49)	(−0.11)
Son/daughter of head	0.738	0.892
	(0.14)	(−0.22)
Primary schooling of household head	1.703	2.384*
	(1.21)	(−1.17)
Secondary or higher schooling of household head	1.449	2.442***
	(0.81)	(−0.19)
Household size	0.916***	0.931***
	(0.03)	(−0.02)
Number of boys in household	1.108	1.031
	(0.16)	(−0.15)
Rural	0.646***	0.582***
	(0.01)	(−0.05)
IWI	1.015***	1.013***
	(0.00)	(0.00)
N	618	517

Standard errors are in parentheses and are clustered at the country level. All regressions include country fixed effects, year fixed effects, and all control variables. Country-level controls include log of GDP per capita, student–teacher ratio in primary school, general government expenditure on primary education as a share of GDP, infant mortality rate, share of population living in urban areas of the country, and total population. Individual- and household-level control variables are reported in the table. IWI is a wealth index that is comparable across surveys. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

A primary reason for the absence of comparable national-level studies in the literature on inclusive education is the lack of quality data on the disability status of children, with variability in disability-related questions across surveys being a major drawback of existing disability data. In this paper, we thoroughly reviewed the available surveys that contain disability-related information and carefully chose comparable ones to use for our analysis. It is worth reiterating that this study does not consider all types of disabilities to ensure that the regression estimates are not biased by measurement and sampling errors when pooling together different surveys.

Still, the estimation strategy used in this study has a few limitations arising from the nature of the data available. A key assumption of the difference-in-difference method is that the underlying outcome trends are similar across the treatment and control countries in the absence of the policy intervention. We cannot test the validity of this assumption in the absence of multiple years of pre-policy data in all three countries, but the lack of significant differences in the characteristics of the children with disabilities in the treatment and control countries in the pre-policy years lends credibility to our findings. Another threat to the causal interpretation of the results of the difference-in-difference method comes from other policies and programs targeting children with disabilities that may have been introduced during the study period. In-depth studies in each country are needed to understand the nature and contributions of national and sub-national disability movements.

Given that inclusive education involves addressing issues of input (such as access and resources) as well as processes (such as teacher training, curriculum, and attitudes towards people with disabilities) (Singal, 2006), further research is necessary to help understand the different components of inclusive education and their relative contributions. It is important to note that our results show a negative association between the inclusive education law in Uganda and the likelihood of school attendance among children with no ability to see, hear, or engage in physical activities, which could be indicative of the interaction of the law with these other factors. Further research is needed to examine why this occurrs.

Nevertheless, this study is a first step towards understanding the influence of inclusive education laws and policies that operate at scale. Our study indicates that inclusive education laws can improve the educational outcomes of children with disabilities. It is, therefore, likely that the gains from the improved likelihood of children with disabilities attending schools will outweigh the costs of creating and maintaining an inclusive education system. Eighty to ninety percent of children with special educational needs can be educated in regular schools with no or minimal adaptations, such as teacher training and child-to-child support (UNICEF, 2012). Our findings from Uganda also suggest that the implementation of such laws can be effective in lower-income settings. Further, there exists evidence that the cost of making schools physically accessible is often less than 1% of total construction costs (Steinfeld and Edward, 2005). Given that various studies indicate that the share of GDP lost due to disability ranges from 8% to 36 % (UNICEF, 2012), it is critical for governments to prioritize investments in inclusive education systems.

CRediT authorship contribution statement

Bijetri Bose: Conceptualization, Methodology, Formal analysis, Writing - original draft. **Jody Heymann:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing - review & editing.

Appendix A

Indicator name	Long definition
Country-level variables	
Pupil–teacher ratio in primary school	Primary school pupil–teacher ratio is the average number of pupils per teacher in primary school.
GDP per capita, PPP (constant 2011 international $)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2011 international dollars.
Government expenditure on education, total (% of GDP)	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. General government usually refers to local, regional, and central governments.
Mortality rate, infant (per 1000 live births)	Infant mortality rate is the number of infants dying before reaching one year of age, per 1000 live births in a given year.
Population, total	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.
Urban population (% of total)	Urban population refers to people living in urban areas as defined by national statistical offices.
Household-level variables	
Household size	The number of members living in the household at the time of the survey.
Number of boys in household	The number of boys aged 14 years or less living in the household at the time of the survey.
Education level of household head	Indicator for whether the household head attended no school, primary school, or higher.
Rural residence	Indicator for whether the house is located in a rural or urban area.

Wealth index	The International Wealth Index (IWI) is a comparable asset-based wealth index based on information collected from 165 household surveys in 97 developing countries on the possession of consumer durables, access to basic services and housing characteristics. These variables were entered into a principal component analysis from which the first factor is selected as the wealth index. The IWI ranges from 0 to 100, with 0 implying no ownership of the consumer durables, lowest quality housing and no connection to public utilities. The Global Data Lab Global Data Lab (2020) has developed data files to add IWI to a large number of DHS and MICS surveys, which we used when available. When these data files were not available, we generated the index using the syntax file that contains the formulas for computing IWI provided by the lab.
Individual level variables	
Age	Age of the child as reported by the household head. We also included age-squared in the regression.
Sex	Gender of the child as reported by the household head.
Relationship to household head	Indicator for whether the child is an offspring of the household head.

Appendix B. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijedudev.2020.102208.

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