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Learning Poverty when schools do not teach in children's home language: A comparative perspective

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ABSTRACT

By analyzing data from 56 countries and conducting a qualitative analysis of the cases of Singapore and Burundi, this study identifies a compelling link between Learning Poverty and linguistic discordance—showing a pronounced positive correlation between lower country-level literacy outcomes and higher misalignment between students' home language and the language of instruction at school. Critically, this comparative study reveals this correlation as most pronounced in middle-income countries and demonstrates the need to attend carefully to local contexts. Findings call for prioritizing research and policy attention to language of instruction and linguistic discordance globally toward achieving basic education for all.

"Education is both a human right in itself and an indispensable means of realizing other human rights. As an empowerment right, education is the primary vehicle by which economically and socially marginalized adults and children can lift themselves out of poverty and obtain the means to participate fully in their communities. Education has a vital role in empowering women, safeguarding children from exploitative and hazardous labour and sexual exploitation, promoting human rights and democracy, protecting the environment, and controlling population growth. Increasingly, education is recognized as one of the best financial investments States can make. But the importance of education is not just practical: a well-educated, enlightened and active mind, able to wander freely and widely, is one of the joys and rewards of human existence."

(UN Committee on Economic, Social and Cultural Rights, 1999)

1. Introduction

While basic literacy captures only a sliver of the goals of education that we aspire to achieve for all children, the stark reality is that educational systems failed to develop that foundational knowledge for 48% of the world's young learners, as measured in 2015 (World Bank, 2019b)—a figure likely exacerbated by the COVID-19 pandemic. This study investigates a possible contributor to this learning crisis: A significant portion (at least 40%) of children globally are schooled in a language they do not speak or understand best (Walter and Benson, 2012; UNESCO, 2016), a phenomenon I call linguistic discordance. How

does this prevalent and expanding phenomenon, which indicates misalignment between students' first language (L1) and the language of instruction at school (LOI), affect their education? Is the rate of students experiencing linguistic discordance linked to country-level literacy outcomes? Does this association differ across varying country income levels? And might a wide comparative investigation reveal valuable insights, contributing to the pursuit of "Sustainable Development Goal 4: Quality Education" and the goal of providing basic literacy and education for all?

This study endeavors to address these questions by examining the likelihood of an association between (a) the rate of students per country who experience linguistic discordance (RLD) in early primary education and (b) the rate of children per country who are not able to read and understand a simple text by age ten (Learning Poverty or LPV). My sample includes 56 countries with a dataset sourced from the UNESCO Institute for Statistics (UIS) for RLD and the World Bank (WB) for LPV (WB, 2019a; UIS, n.d.-a). Additionally, I explore variations in this association among low-, middle-, and high-income countries based on the WB's country income classification (WB, n.d.-b). Finally, I conduct a qualitative analysis into the relation between the studied variables in two countries, Burundi and Singapore, which are notable data outliers in the sample. This "outlier analysis" serves to better illuminate the investigated correlation and enhance our understanding of statistically observed trends (Aggarwal, 2017).

A sizable body of literature has investigated LOI policy, planning, and practices in primary education—traditionally in countries with

linguistically diverse populations, those with a colonial LOI legacy, within the context of indigenous language revitalization, and in countries recently introducing English as LOI (e.g. Hornberger, 2008; Trudell and Piper, 2014; Taylor and von Fintel, 2016; Steele et al., 2017; Dascomb, 2019; Sah and Karki, 2020). Several studies with strong empirical designs exist at the country or sub-national level. For example, one study leveraged Ethiopia's 1994 language policy change as a natural experiment, estimating that switching to LOI=L1 for the country's largest ethnic group led to an increase of .75 to one year of primary school attendance for the affected cohort, as well as a 31% increase in enrolled students' completion of at least six years of schooling (Ramachandran, 2012). In another longitudinal study with a national dataset of 9180 South African elementary schools, researchers found a causal relation between LOI=L1 in early primary grades and improved L2 (English) development, as measured in fourth, fifth, and sixth grades (Taylor and von Fintel, 2016). This finding echoes that of research in the U.S. showing that dual-language immersion for Spanish and other minority language speakers improves reading (including in L2) and has some benefit and no harm in the areas of math and science (Steele et al., 2017). At the sub-national level, a longitudinal study across 24 comparable schools in Cameroon found suggestive evidence that teaching first-to-third grades in L1 before switching to English (L2) as LOI reduced dropout rates by around 22 and 14 percentage points by third grade and fifth grade, respectively (Laitin et al., 2019). Additionally, a number of LOI-related studies have used a comparative research design across countries (e.g. Baldauf et al., 2011; Piper and Miksic, 2011; Ó Duibhir et al., 2015).

The present study contributes to the existing LOI literature methodologically, by providing a wide comparative analysis across 56 countries spanning six continents—to my knowledge the most extensive empirical comparison in this field to date—and by examining countries' income levels as a potential moderator of the relation between LPV and RLD. Moreover, this study takes advantage of newly released datasets: as of 2019 and after 2017 for LPV and RLD, respectively (UIS, 2017, 15; WB, 2019a; b). The RLD data is based on responses by individual students regarding LOI, which better reflects linguistic diversity in the classroom compared to measures such as the number of languages per country or region. Through this granular perspective, this study uniquely includes countries with more linguistic diversity (e.g. Canada and Indonesia), where LOI-related studies are traditionally conducted, alongside countries with less linguistic diversity (e.g. Japan and Poland). Finally, this study's quantitative design is complemented by a qualitative outlier analysis of two countries, Burundi and Singapore, which are noteworthy data outliers. Examining the case of Burundi, where most children do not have basic literacy despite having their L1 as LOI, and that of Singapore, where the situation is reversed, serves to strengthen the study's findings, deepen our understanding of the investigated relation within and beyond these contexts, and shed light on the nuances of LOI data collection.

Consistent with prior research, and supported by recently available data from a wider sample of countries, my findings reveal a strong, statistically significant, positive linear association between LPV and RLD. In other words, countries with higher percentages of children whose LOI differs from their L1, or who experience linguistic discordance, tend to have higher Learning Poverty rates, whereas those with more students who are schooled in their L1 exhibit lower Learning Poverty. I find that this association persists when controlling for country income (Gross National Income, or GNI, per capita). Furthermore, my analysis reveals that while the positive association is present across the sample regardless of country income level, it presents as strongest in middle-income countries—a novel insight in the LOI field.

In this paper, I reference students' first language or mother tongue as L1, indicating a language (and possibly multiple languages) which they know and understand before they start formal schooling. I use L2, or second language, to refer to one which students do not know or understand by the time they start school. While L1 and L2 are used to facilitate reading and analysis, it is important to note that the two linguistic codes have fluid boundaries and interact in the minds of bilingual learners (Grosjean, 1989). Adapting a term from the medical field that describes language nonconformity between physicians and patients (Cano-Ibáñez et al., 2021), I use "linguistic discordance" to convey the mismatch between LOI and students' L1 during primary education, while acknowledging the non-pure nature of individual languages. The variable "rate of linguistic discordance per country" is operationalized in the section "Data and Sample." The discussed impacts in this paper are tied to students experiencing linguistic discordance from the onset of primary education and concern teaching via a linguistic medium across the curriculum, as opposed to teaching a language as a standalone subject—an important differentiation outlined by DeGraff (2019) as teaching "in" versus "of" language. In the following sections, I present the study's theoretical framework and methodology. I then present the results obtained through a combination of statistical analysis and qualitative examination of two trend outliers. I subsequently discuss these findings and explore their implications.

2. Theoretical framework: literacy and bilingual development

Heugh's (2011) examination of the cost implications of providing mother-tongue and robust bilingual models of education in Africa underscores the critical need for economists to possess relevant information on literacy and language development. This understanding is equally vital for those concerned with the educational outcomes of students not schooled in their L1, as well as for the broader student population, given that all schooling is language-mediated. In this section, I present the theoretical underpinnings and empirical insights related to LOI and language and literacy development, which ground my analysis and are crucial for engaging with the present study.

The Program for International Student Assessment (PISA) defines "reading literacy" as "an individual's capacity to understand, use, evaluate, reflect on and engage with texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society" (OECD, 2019, 14). This definition highlights how central understanding is to reading, beyond the ability to decode text. Turning to literacy and LOI, there is an intimate connection between literacy development and the utilization and deepening of background knowledge. When children are taught to read in their L1, their existing knowledge of the world, as well as of language itself (for example, vocabulary, syntax, and verbal reasoning), is mobilized to foster proficient reading (Scarborough, 2009). As such, oral language knowledge forms a critical foundation for the development of children's reading skills, irrespective of whether they are mono- or multilingual. Additionally, possessing background knowledge—even if limited—about specific natural or cultural events, for example, enhances children's ability to understand written text related to those events. The acquisition of such knowledge primarily occurs through oral means early on (in L1), and as children learn to read, reading itself becomes an additional avenue for gradually expanding their background knowledge.

Literacy development in L2, like that in L1, builds on prior knowledge. Students with more knowledge of school-related vocabulary in L1 demonstrate better abilities to engage in conversational moves related to academic tasks (e.g. collaboration, discussion) in L1, are more proficient in academic skills (e.g. defining, classifying) in L1, and will find it easier to learn of/in L2 at school (Phillips Galloway et al., 2020; Uccelli and Phillips Galloway, 2017). Moreover, phonological awareness and decoding skills transfer from one language and script to another, even when two languages have different writing systems (Abadzi, 2006, 52; Bialystok, 2007; Benson, 2008). The linguistic interdependence hypothesis posits that "the development of competence in a second language (L2) is partially a function of the type of competence already developed in L1 at the time when intensive exposure to L2 begins" (Cummins, 1979, 222). This hypothesis helps explain the (possibly counterintuitive) finding that linguistic discordance in early primary

grades in South Africa caused lower performance in *L2* in later grades (Taylor and von Fintel, 2016). It is also consistent with various national efforts to provide mother tongue-based multilingual education, where schooling starts with LOI=L1 until third-sixth grade and moves to LOI=L2 thereafter (WB, 2021).[1]

Once someone starts reading, the more vocabulary they acquire, the more readily they are able to read and understand content and, in turn, the more additional vocabulary they will be able to decipher and learn. Known as the Matthew Effect (Stanovich, 2009), this reciprocal relation implies that proficient readers will become better readers, while those facing challenges will become worse relative to their peers. Students grow their vocabulary knowledge and become better and faster text-decoders with more opportunities for practice. Such opportunities enable "building decoding skills that will form a bridge to reading comprehension and that will have a reciprocal, causal relationship with reading comprehension" (Pikulski and Chard, 2005, 511). Exposure to and learning from written text extends beyond language arts classrooms, encompassing various subjects that collectively contribute to literacy development. Investing in L1 language and literacy development holds intrinsic importance. Even when undertaken to support L2 development, researchers advocate for teaching in L1 as LOI for a period of five to six years (or at least six, based on different sources) (Collier and Thomas, 2017; WB, 2021, 11). This recommendation underscores the importance of having concerted efforts across the curriculum and over an extended period for basic literacy development in L1.

Furthermore, the role of teachers is not to be discounted, whether they are teaching literacy in a language subject or via other subjects across the curriculum. Findings of a study conducted in Tanzania are telling:

> Teachers… used several pedagogical strategies more frequently in L1-medium than in L2-medium lessons. They signaled lessons and explained concepts more clearly; they used more questions and prompts and provided a wide range of feedback to learners; they used a wider range of assessment strategies; they provided more opportunities for group-, pair- and individual work and writing; they elicited responses from a wider range of learners, with more extended and spontaneous responses; and finally, they spoke less. (Afitska et al., 2013, p. 158)

Teachers have been demonstrated to be more effective when teaching in a language they are fluent in, compared to their counterparts, for instance in countries where LOI is the language of the historic colonizer, where both teachers and students are mandated to use an L2 in the classroom. Additionally, when teachers can express themselves more comfortably, they are better equipped to foster student engagement, plausibly enhancing learning.

Finally, the more readers are able to understand what they read, aided by their developing general and linguistic background knowledge, the greater their motivation and self-efficacy as readers and pursuant engagement with text will be. This will, in turn, expand their overall plus linguistic background knowledge, and so on (Snow, 2010). Additionally, lessons delivered in a language in which learners are not yet fluent impose heightened cognitive demands (Clegg, 2007). An educational experience requiring understanding of abstract concepts, specialized vocabulary, and the L2 medium is not only burdensome but also frustrating for some students, decreasing their motivation to read (Benson, 2008), and will push some out of the school system altogether (Laitin et al., 2019).

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[1] Deaf individuals, like their hearing counterparts, develop higher literacy skills, including in L2, when educated using a signed language (L1) as LOI (see Branson and Miller, 1993).

3. Methodology

This study seeks to answer the following research questions: does LOI in primary education systematically influence students' basic literacy outcomes, and if so, why? Additionally, if such an impact is identified, is it systemically mediated by country income levels or differentiated across country income levels, and why? To tackle these questions, I leverage four datasets, yielding a sample of 56 countries with complete data on four variables: LPV, RLD, GNI per capita, and country income level.

3.1. Data and sample

LPV, or Learning Poverty, is a basic literacy indicator delineating the rate of children per country who are unable to read and understand a simple text by age ten. LPV is reported as being calculated using high quality cross-national and national large-scale assessments in grades 4–6 (WB, 2019a). Data are compared across countries based on the "Minimum Proficiency Level" for reading at the end of primary school, which is defined by the Global Alliance to Monitor Learning as:

> Students independently and fluently read simple, short narrative and expository texts. They locate explicitly-stated information. They interpret and give some explanations about the key ideas in these texts. They provide simple, personal opinions or judgements about the information, events and characters in a text. (WB, 2019a, p. 11)

Adjusted net enrollment rates for primary school, published by UIS, are used to construct the LPV indicator so that it accounts for out-of-school children, who are assumed to be unable to read (WB, 2019a, p. 12). This adjustment enhances the measure's representativeness at the national level, compared to indicators solely reliant on data pertaining to enrolled students. The present study employs LPV data from 2014–2016, with four exceptions reaching back to 2011 due to data availability (see Table A1 in Appendix A) (WB, 2019a; b).

Turning to language-in-education, UIS shares country-level data on the linguistic match between school and home in the form of the indicator "students in early grades who have their first or home language as language of instruction (%)" (UIS, 2023; n.d.-a). For the available primary school data used in this study, the indicator is constructed using the language of school tests as a proxy for LOI, compared with student responses that they speak the language of the test at home more than "sometimes" or "never." The student responses are derived from the international learning assessments TIMSS and PASEC, conducted in grades four and two and in 2015 and 2014, respectively (see Appendix A for details per country). These data are collected at the student level and aggregated at the national level (UIS, 2023; n.d.-a). The international assessment in mathematics and science, TIMSS, is reported as being nationally representative and engaging of approximately 4000 students from 150–200 schools per country (Mullis et al., 2015). Similarly, PASEC, an international assessment that is mainly administered to students in francophone Sub-Saharan Africa, is reported as being nationally representative, with 900 participants per country on average (PASEC, 2015). This study employs UIS-curated and published country-level LOI=L1 data for early primary grades (second and fourth), with the sole alteration of flipping the indicator into LOI≠L1 to obtain the rate of linguistic discordance (RLD) experienced by students in early primary grades—also a country-level metric.

My usage of concurrently (and not longitudinally) collected data for LPV and RLD is based on the assumption that LOI policies and practices were consistent in the two-to-four years prior to LPV data collection. Finally, I also employ the WB's country-level indicator GNI per capita (in USD) as well as the WB's analytical classification of countries based on that indicator in 2016 into low-income (<= $1005 pear year), middle-

income ($1006–12,235), and high-income countries (>$12,235) (WB, n.d.-a; -b).[2]

The resulting sample includes 35 high-income, 14 middle-income, and 7 low-income countries (including the territory of Hong Kong). GNI per capita has a multi-modal distribution in the dataset and median of $18,800. The mean value of LPV is 27%, the median is 9%, and the interquartile range is 4–37%, likely because of lower LPV rates in middle-income countries. The ten countries with the highest rates of LPV in the sample are all located in Africa. RLD has a bimodal distribution with one mode at 99% and another at 15%, with its interquartile range being 12–46% (see Appendix A for visual representations of the distributions of these variables). All country income groups have students who experience linguistic discordance: A fair number of high- and middle-income countries (for example, Chile, Norway, and Italy) do so, at rates of 10–16%. Others include Canada, Iran, Singapore, and many Arab Gulf states. The phenomenon is more pronounced in some middle-income countries such as Indonesia (56%) and Morocco (53%). Finally, LOI in many low-income countries is their historic colonizer's language; for example, French in Burkina Faso and Niger, and English in Cameroon, with virtually the entire student population not being taught in L1.

3.2. Analytic approach

I combine quantitative and qualitative research methods in this study. First, I conduct a linear regression analysis of the relation between a country's rates of Learning Poverty and linguistic discordance. I hypothesize that there will be a strong relation between the two variables. Second, I control for country income as a potentially strong predictor of educational outcomes (Brückner and Gradstein, 2013). Third, I fit an interaction model with a categorical country income variable, including high-, middle-, and low-income countries, in order to explore the variability of the main trend between these country groups, followed by interacting each level of the categorical country income variable independently with RLD. Overall, I utilize the software R and use heteroscedasticity-robust standard errors when fitting my statistical models. Finally, I conduct a qualitative outlier analysis which focuses on "data points that are significantly different from the remaining data" and could help in gathering more information about the observed trend and further investigating its strength (Aggarwal, 2017, 1). I discuss two strong trend outliers in this study's dataset, Burundi and Singapore. I chose these countries due to the higher degree of their deviance from the observed trend, their variation from it in different directions, plus contextual differences between the two countries. For each of the two cases, I examine the studied variables and explore contextual factors to find out the reasons behind Singapore's remarkably low LPV despite most of its students experiencing linguistic discordance. Conversely, I investigate why Burundi exhibits a contrasting pattern—having very high LPV despite most of its children being instructed in their L1.

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[2] I refrain from using linguistic diversity at the national level, such as the number of languages per country, as a control variable. This is not only because this information is partially conveyed via the RLD variable, but also because such measures at the national level may hide important data. For instance, Uyghur speakers represent less than 1% of the Chinese population but number about 11 million people and predominantly live in a specific geographic area (Meesala, 2020). This example illustrates how a country can have high linguistic diversity at the national level concurrently with students in specific villages or regions having a shared L1. It aligns with research showing that 75% of the global linguistic discordance issue can be addressed by adding only 220 LOIs (for about 270 million children) compared to teaching in each of the world's 7000 + languages (WB, 2021, 10, 21). Finally, it supports this study's use of an indicator that is largely based on student-reported LOI=L1 information.

4. Results

4.1. Statistical analysis

I conducted a linear regression analysis of the relation between LPV and RLD. I found a positive linear association between the two variables in the population of countries represented in the sample ($t(54) = 13.512, p < .001$), estimating that two countries that differ by 1 percentage point in RLD differ by .85 percentage points in LPV on average, with a positive correlation of .84 (Fig. 1). My fitted model with heteroscedasticity-robust standard errors was:

$$\widehat{LPV}_i = -.70 + .85RLD_i. \tag{1}$$

I added GNI per capita as a control variable and, using heteroscedasticity-robust standard errors, fit the model:

$$\widehat{LPV}_i = 14.52 + .73RLD_i - .0005GNI\_per\_capita_i. \tag{2}$$

I tested a null-hypothesis of no association between LPV and RLD in the population, controlling for GNI per capita, finding a positive linear association between the two variables in the population of countries included in the sample, even with the added control variable ($t(53) = 8.683, p < .001$). As such, controlling for GNI per capita, I estimated that each 1 percentage point increase in RLD is associated with a .73 percentage point increase in LPV on average. Comparing countries with the same RLD, I also estimated that each 100-dollar increase in GNI per capita is associated with a .05 percentage point decrease in LPV. In other words, that increased income was associated with decreased LPV, regardless of RLD. This association was also statistically significant and non-zero in the population ($t(53) = -3.13, p = .003$).

To investigate the association further, I fit an interaction model with a categorical country income variable (*Country_Income_Numeric*) including high-, middle-, and low-income countries *(Income_H, Income_M, and Income_L,* respectively). No significant interaction was detected in this model (Model 3), likely because of little variation in RLD as well as LPV values among the seven low-income countries in the sample. In fact, six of these have an RLD that is equal to or above 99% (Fig. 2). To verify this hypothesis, I ran separate regressions similar to Model 1 for each of the country income groups and only found the relation between the two variables among high-income and middle-income countries to be statistically significant, but not so for low-income countries (Fig. 3). This does not mean that the relation is not present in low-income countries, but that it is not statistically significant based on available data, which are limited in the case of the RLD variable. Given that LPV data are broader, I examined these beyond the study's sample and found LPV to have a high central tendency in all 14 low-income countries for which data are available for 2014–2016 (mean= 88.5%, median=88%, and interquartile range=85–93% (WB, 2019b; n.d.-b). This means that, regardless of RLD in each of these 14 countries, the actual association between the two variables in the population will likely not veer much from the non-statistically significant correlation represented in the low-income countries plot in Fig. 3.

As a next step, I interacted each level of the categorical country income variable independently with RLD, fitting the following model using heteroscedasticity-robust standard errors:

$$\widehat{LPV}_i = 93.43 - .07RLD_i - 93.83Income\_H_i - 91.39Income\_M_i + .66RLD_i$$
$$* Income\_H_i + .96RLD_i * Income\_M_i. \tag{4}$$

I rejected the null hypothesis of all model coefficients equaling zero in the population ($F(5, 50) = 79.87, p < .01$) and found the following relations: Per each 1% point increase in *RLD*, I estimated that the increase in *LPV* is .96 steeper in middle-income countries compared to low-income countries. Findings were similar although less pronounced in high-income countries: per each 1 percentage point increase in *RLD*, I
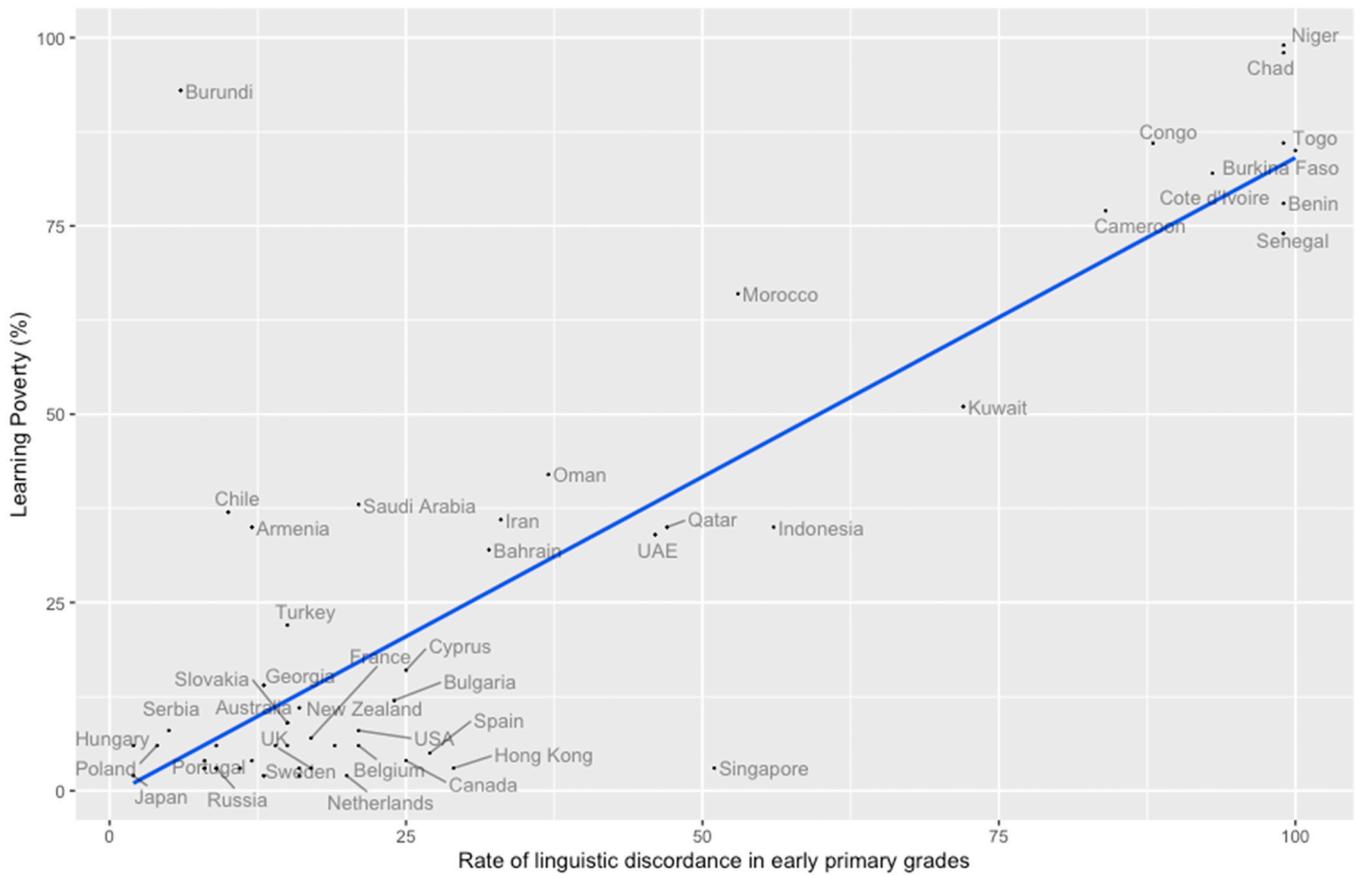
Fig. 1. The robust positive correlation between the rate of linguistic discordance (students with LOI≠L1) in early primary grades and Learning Poverty across various countries (n = 56).
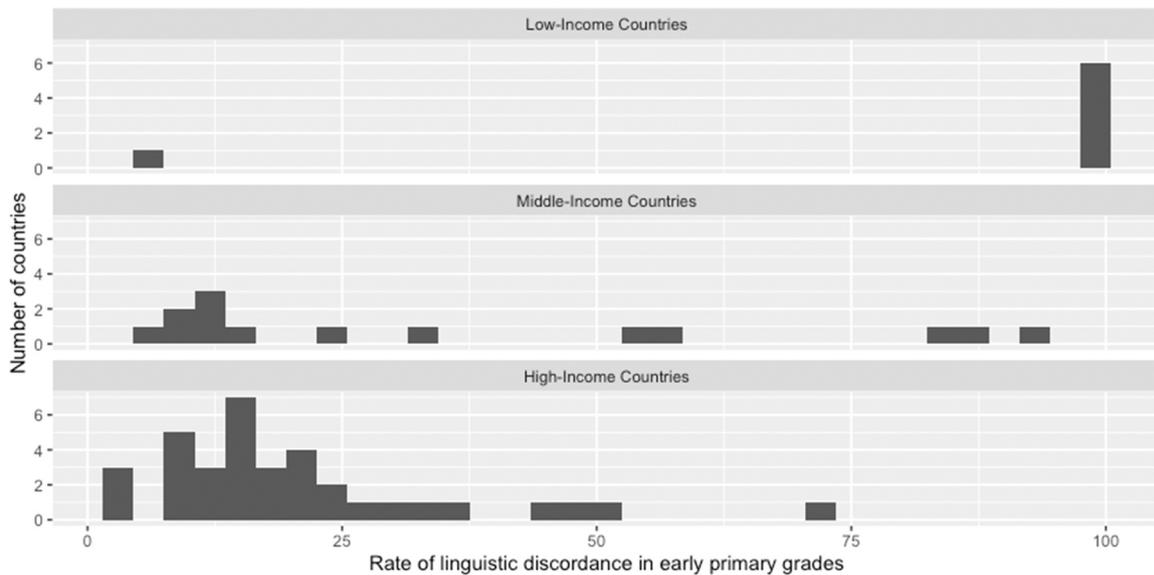

Fig. 2. The rate of linguistic discordance in early primary grades across different country income levels in the sample (n = 56).

estimated that the increase in *LPV* is .66 steeper compared to low-income countries. Finally, to compare the models' fit, I conducted a null hypothesis test of no difference in accuracy between models 2 and 4, finding evidence that Model 4 fit the data better ($\chi^2(3) = 34.83, p < .001$) (Table 1).

4.2. Descriptive analysis of two trend outliers

Two noteworthy data outliers in this study are Singapore and Burundi. Singapore exhibited a low LPV rate despite a high rate of linguistic discordance, while Burundi displayed a high LPV rate despite a low rate of linguistic discordance. Below, I discuss multiple factors that
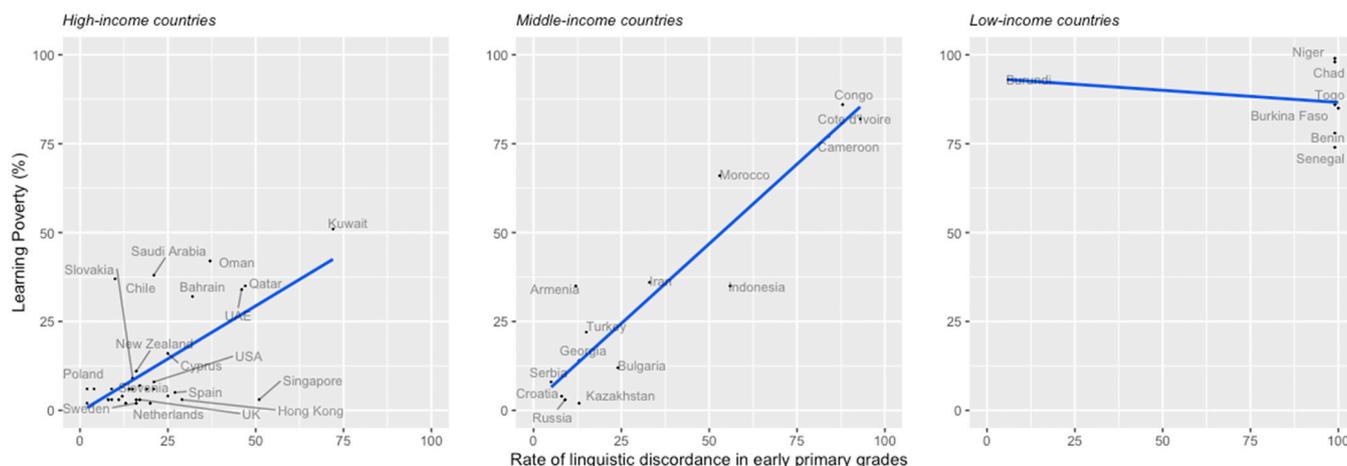
Fig. 3. Regressions of Learning Poverty on the rate of linguistic discordance across countries in the sample, organized by country income level.

Table 1

Series of regression models of the association between country-level rates of linguistic discordance (RLD) in early primary grades and Learning Poverty, considering variation in country income.

	Dependent variable: LPV			
	(1)	(2)	(3)	(4)
RLD	0.848 **	0.727 **	0.322 *	-0.068
	(0.073)	(0.068)	(0.187)	(0.127)
GNI_per_capita		-0.0005 **		
		(0.0001)		
Country_Income_Numeric			-23.197 **	
			(5.101)	
RLD x Country _Income_Numeric			0.147	
			(0.091)	
Income_H				-93.830 **
				(12.118)
Income_M				-91.392 **
				(12.522)
RLD x Income_H				0.664 **
				(0.179)
RLD x Income_M				0.964 **
				(0.158)
Constant	-0.698	14.523 **	64.547 **	93.426 **
	(3.299)	(4.387)	(13.799)	(11.689)
Observations	56	56	56	56
R^2	0.712	0.793	0.811	0.889
Adjusted R^2	0.707	0.785	0.8	0.878
Residual Std. Error	16.989 (df = 54)	14.554 (df = 53)	14.046 (df = 52)	10.979 (df = 50)
F Statistic	133.673 ** (df = 1; 54)	101.353 ** (df = 2; 53)	74.187 ** (df = 3; 52)	79.867 ** (df = 5; 50)

Note.—Analysis uses a simple linear regression model with low-income countries as the reference category.

*p < 0.1.

**p < 0.01.

Sources.—LPV (WB, 2019b); RLD (UIS, n.d.-a); GNI per capita (WB, n.d.-a; -b).

help explain their data, while recognizing limitations in capturing the complexity of each country's context within the confines of this article.

Burundi's LPV is 93% and RLD stands only at 6%. Why are its basic literacy outcomes so low when the great majority of its students learn in their L1? On the linguistic discordance front, while official policy stipulates that Kirundi, the national language, shall be used in primary education, LOI shifts to French starting in fifth grade, when Kirundi starts being taught as a subject with relatively low hours of instruction (Mazunya and Habonimana, 2010, 11; Rwantabagu, 2011). This shift manifests in French assuming a prominent role in primary school curricula, which influences teachers' language preferences in the classroom and parallels low investment in training teachers to teach in Kirundi (Rwantabagu, 2011). Therefore, the LOI=L1 statistic reported by UIS is not fully reflective of classroom realities in which French-mediated instruction may in fact be the predominant or at least a substantial modality. Additionally, Burundi's 55.4% dropout rate for primary education in 2014 (World Data Atlas, n.d.) may mean that about half the country's children do not access school in their home (or any) language; yet are included as having LOI=L1 in UIS's statistic, which does not capture school dropouts (UIS, 2023).

On the LPV front, Burundi's persistent high poverty levels (GNI per capita was USD $270 in 2016) and prolonged internal conflict have greatly impacted educational quality in the country. For instance, in 2014 there was a shortage of teachers, low teaching hours caused by a double-shift schooling system, and high rates of student attrition and grade repetition (World Vision Burundi, 2014). In 2016, more than a third of primary schools lacked access to basic drinking water and sanitation facilities (UIS, n.d.-b). Furthermore, the literacy measure which constitutes the Burundi LPV statistic used in this study is based on reading in French (rather than Kirundi) in sixth grade, only one year

after French officially becomes LOI there (WB, 2019b; n.d.-c). Despite noted concerns about the quantity and quality of teaching Kirundi, it is likely that the LPV rate would be lower had basic literacy been measured based on reading and understanding in Kirundi (L1) versus French, an L2 in which literacy needs several years to develop, supported by L1 literacy development.

In contrast, Singapore's LPV is 3%, while its RLD is a high 51%. Why is its Learning Poverty so low despite over a half of its students experiencing linguistic discordance at school? The source of the RLD statistic for Singapore is the TIMSS assessment for fourth grade; specifically, a question to students on whether they speak the language of the test (English here) at home, where participants' answers were: always (28%), almost always (20%), sometimes (48%), and never (4%) (Mullis et al., 2015, 98). The first two rates represent the 48.59% reported by UIS as students having LOI=L1, which I inverted and rounded to 51%—the rate of linguistic discordance in the country (UIS, n.d.-a). These self-reported data align with the 2000 census data, reflecting that 40% of all Singaporean children aged 5–14 self-report English as their predominant home language (Dixon, 2005). This knowledge of the LOI may mitigate potential drawbacks of linguistic discordance, since the LOI is not truly foreign for most and is used by the majority of the children to speak at home sometimes, almost always, or always.

Turning to the country's language-in-education policies, while English is the LOI, students are required to study their "mother tongue" as a subject and are tested in it in national examinations (Pakir, 2003; Dixon, 2005). Notwithstanding that most students study the "mother tongue" subject at a "second language" level, with standards being lower than those for English, such study of L1 alongside L2 likely supports the development of L2 based on linguistic interdependence and transfer in multilingual development (Cummins, 1979; Bialystok, 2007). The academic study of L1, whose high quality is mediated by Singapore's philosophy of "educational excellence" (Pakir, 2003, 119), as well as the stake it has in the intensely-prepared-for national examinations, differentiates Singapore's education system from Burundi's and likely other countries in the sample, where LOI is not L1 but no or only limited study of L1 is part of formal schooling.[3]

On the LPV front, we should keep in mind that LPV is a measure of basic literacy. Students' world-class academic achievement in Singapore makes its low LPV statistic unsurprising. Many factors impact Singaporean students' academic outcomes; from those related to schooling, such as teacher quality, research-informed pedagogies and curricula, national high-stakes examinations, and a governmental commitment to academic rigor, to those extraneous to school, such as parental pressure and spending on education (see Pakir, 2003; Deng and Gopinathan, 2016). Of additional note is the conscious effort to make the curriculum culturally relevant for students despite linguistic discordance, plus the strong academic support and recognition—via national assessments—given to learning students' L1 (Pakir, 2003).

In conclusion, the weak association between the two variables in Burundi and Singapore does not weaken the observed robust positive association between LPV and RLD. This is due to the presence of multiple factors influencing LPV in each of the two countries away from the observed trend, others that mitigate the negative impact of linguistic discordance in Singapore, and evidence that RLD in Burundi is likely higher than that in this study's dataset. The analysis also sheds light on nuances of LOI data collection (see Piper and Miksic, 2011; Benson,

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[3] One caveat to consider is that a limited number of "mother tongues" are taught in school in Singapore. This means that a minority of students who do not speak one of these languages at home are "assigned" a mother tongue, such as Mandarin Chinese for speakers of other Chinese dialects. In effect, these students study two L2s at school—one as LOI and the other as a language subject (Pakir, 2003, 120; Dixon, 2005). However, Singaporean students facing challenges in relation to content or language instruction receive ample assistance through afterschool support programs (Pakir, 2003, 120).

2016). While the language of school tests versus actual language use in the classroom is likely to match that of curricula and is a good proxy for LOI, whether the teacher's and/or students' language is a mix of L1 and L2 in the classroom or solely in one language or another makes a difference in student learning. The timing of data collection also matters, considering the temporal arc of L2 literacy development.

5. Discussion

Motivated by existing empirical literature on linguistic discordance from different countries, and with interest in exploring an international trend, I investigated the relation between LPV and RLD in 56 countries, using UIS- and WB-curated data from 2014–2016. The study revealed a strong positive correlation (r = .84) between the two variables across the countries in the sample, which remained strong even after controlling for GNI per capita (in USD). Specifically, for each 1 percentage point increase in RLD, I estimate a .73 percentage point increase in LPV on average, controlling for income. In other words, holding country income constant, the higher the rate of children who experienced a dissonance between their home and schooling languages (rate of linguistic discordance per country or RLD), the higher the rate of children unable to read and understand a simple text by age 10 in that country (LPV). Put another way, lower LPV rates are observed in countries with higher rates of students schooled in their L1 as LOI. Considering that the RLD variable, unlike LPV, does not capture out-of-school children (UIS, 2023), the possibility of children dropping out of school due to linguistic discordance, and that data collection at the national level might not accurately represent linguistic minorities (Omoeva et al., 2013, 33–34; Benson, 2016, 19–20), the observed findings may be an underestimate of an even stronger association. Furthermore, an outlier analysis of Singapore and Burundi—where data strongly veered from the observed trend—did not weaken the findings' robustness, and helped illustrate the intricacies of LOI policies and practices and their impact. Finally, I estimated that, per a single percentage point change in RLD, the positive association is .96 steeper in middle-income countries and .66 steeper in high-income countries compared to low-income countries.

5.1. LOI and its contribution to school literacy outcomes

What we know about literacy and bilingual development, which I presented earlier as the theoretical framework that grounds this study, helps explain the findings. First, literacy development builds on and is facilitated by prior knowledge, including general background knowledge and knowledge of and about language itself (Scarborough, 2009). As such, learning first in L1 (as LOI) promotes better learning outcomes in L1, since background knowledge is primarily acquired via oral means in early childhood and since children are more likely to be knowledgeable about their L1 as a language at that age, compared to an L2. Learning first in L1 also promotes better learning of/in L2 (as a subject, or later as LOI) for the same reasons and due to the fact that some learning is transferable across languages (Cummins, 1979; Benson, 2008; WB, 2021). Aligning with this study's findings, when students experience linguistic discordance during primary schooling, they face two challenges: a) the background knowledge and learning scaffolds they have in/of L1 are not adequately capitalized upon or expanded for literacy development in either L1 or L2; and b) students lack these same foundations, which are essential for learning to read, in L2, and need to build them rapidly.

Second, the quantity of exposure to and engagement with written text is crucial for early readers, and it mediates how better readers become successively better relative to their worse-off peers, a phenomenon known as the Matthew Effect (Pikulski and Chard, 2005; Stanovich, 2009). LOI's cross-curricular nature impacts students' access to reading material appropriate for their level and reading opportunities that support fluency and vocabulary development. When LOI=L1, students are more likely to have adequate opportunities across the

curriculum to develop their emergent reading skills and background knowledge compared to their counterparts experiencing linguistic discordance. In cases where LOI=L1 in the initial grades of primary school before transitioning to another LOI, students who become proficient readers in L1 and whose background knowledge is expanded through it are better positioned to learn of/in L2 (Collier and Thomas, 2017; WB, 2021). When students face linguistic discordance from the onset of schooling but their L1 is taught as a language subject, some of the harms of not teaching L1 could be mitigated, as the Singapore case shows. Additionally, it is possible that the Matthew Effect plays out on a global scale, contributing to the strength of the observed association, as emerging readers in some countries get supported in developing their reading skills by engaging with texts that build on their background knowledge, coupled with opportunities for practice across the curriculum; and as others contend with L2-medium curricula that fail to adequately leverage their existing linguistic and other knowledge resources, impeding their progress as emergent readers.

Third, in educational systems where LOI is experienced by most teachers and students as L2, the probability of all teachers being fluent in that language decreases. This has adverse effects on teaching quality, as teachers are more effective when they can confidently express themselves (Afitska et al., 2013). This comfort level influences various aspects of teaching, including the range of pedagogic strategies used, clarity in explaining concepts, providing feedback to students, and creating opportunities for student engagement. These implications extend to the teaching of literacy skills in language classrooms and through various subjects across the curriculum.

Finally, student motivation to learn to read is critical. As readers comprehend what they read, their motivation and self-efficacy as readers as well as future engagement with text are enhanced (Snow, 2010). This underscores the importance of initiating students on a trajectory of success as emerging readers early in their education, which is easier to achieve when LOI=L1, as detailed above. Furthermore, the cross-curricular status of LOI could lead to learner frustration across the curriculum, increasing students' rate of dropping out (or being dropped out) of/from school and hurting their prospects of developing basic literacy (Benson, 2008; Laitin et al., 2019).

5.2. Country income groups and the role of education quality

The study reveals a robust positive correlation between rates of linguistic discordance and Learning Poverty across all country income groups. This correlation is most pronounced in middle-income countries, followed by high-income countries, in contrast to countries in the lowest income bracket. What factors could account for these observations?

While the strong positive association is observed in wealthier countries like Canada, the Netherlands, and Spain within the sample, these countries, endowed with greater resources, are better equipped to mitigate the adverse effects of linguistic discordance on literacy development compared to their lower-income counterparts. Minoritized linguistic communities in these countries are more likely to access high-quality literacy resources plus linguistic socialization in the socially dominant language, and to benefit from teachers proficient in the LOI, along with specialists in teaching reading in an L2.[4] They are more likely to experience instructional practices that are well-planned, informed by research, supported by supervisors and policymakers, and which intentionally and strategically build on L1 resources for L2 development when needed (Clegg and Afitska, 2011). Schools within these contexts might have additional staff and resources to support struggling readers

in general, including those experiencing linguistic discordance. It is also plausible that minoritized linguistic communities in high-income countries have more access to bilingual programs, an angle that is not explicit in this study's dataset and which has been found to mitigate drawbacks of lack of instruction in L1, mediated by such programs' quality and duration (Tedick et al., 2011; Steele et al., 2017).

However, as Trudell (2016, 95) asserts, "Language policy, even when well implemented, cannot by itself turn poor learning environments into good ones." In low-income countries such as Chad, Niger, and Senegal, where the positive association between LPV and RLD likely exists, as exemplified in the Ethiopia and Cameroon studies mentioned earlier (Ramachandran, 2012; Laitin et al., 2019), but could not be proven using this study's methods and sample, other variables may influence LPV more than linguistic discordance. These include system-wide hurdles such as teacher and textbook shortages, conflict, school fees, distance from school, and extreme poverty; as well as those specific to groups such as girls, children with disabilities, child laborers, and children from specific marginalized groups (Hawke et al., 2015). These barriers are "often reinforced by irrelevant curricula, poor pedagogy…, and low expectations about the academic potential of certain children" (Hawke et al., 2015, 43–44). Additionally, school time spent on learning might be compromised due to shorter school days, poor classroom time management, and high student and teacher absenteeism (Abadzi, 2006, 53).

Middle-income countries such as Bulgaria, Iran, Turkey, and Côte d'Ivoire, in which the investigated positive association is strongest, may resemble high-income countries in having factors that mitigate LPV, but not enough to overcome the potential impact of linguistic discordance. They could also be less impacted by the multiple challenges faced by their low-income counterparts. Additionally, it is possible that instead of a more structured, research-informed approach that introduces L2 gradually and with adequate supports, the less-effective linguistic submersion or full-immersion approach (sometimes referred to as "sink or swim") is more prevalent in middle-income countries (WB, 2021, 38).

Finally, it is important to note that the variation in the observed positive association's strength across different country income groups does not preclude the presence of within-country populations that do not fit the observed trend; nor of individual student differences.

5.3. Beyond general trends and broad variables: the importance of site-specific factors

Social, cultural, and affective factors such as the social status afforded to one language or another at a given time; language ideologies more broadly; students' cultural and related linguistic identities; and students' sense of belonging at school, linked to their cultures and languages are likely to interact with and mediate the relation between linguistic discordance and basic literacy outcomes at the individual and group levels (see Shin, 2017, 103–13; Azim Premji Foundation, 2018; Tseng, 2020). However, while these factors are important to distill and address in specific contexts in relation to LOI policies and practices, they cannot be generalized at the country income level. Additionally, their relation to the studied association is complicated by the consideration that cultural factors may concurrently represent independent variables influencing educational outcomes in addition to being outcomes of the educational environment itself (Warikoo and Carter, 2009)—with the social status and valuation of one language or another being impacted, for instance, by its position in school curricula or inclusion in high-stakes exams. Looking at the two cases examined earlier: French being the LOI starting in fifth grade in Burundi plus the language of schooling in both secondary and tertiary education translated into it assuming a prominent role in primary school curricula, as well as teachers preferring to use it in the classroom despite the official LOI being Kirundi up to fifth grade (Rwantabagu, 2011). In contrast, while English is the LOI in Singapore and students only study their L1s as language subjects, the fact that these subjects are included in high-stakes

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[4] I use the term "minoritized linguistic communities" to encompass both traditionally construed linguistic minorities and groups experiencing linguistic marginalization despite their substantial population size within their respective countries.

national exams, combined with student and parental high valuation of education, translated into higher literacy outcomes in these L1s (Pakir, 2003; Dixon, 2005).

Finally, the study illustrated data-collection and interpretation intricacies related to LOI. For instance, Singaporean students who reported that they spoke English "always" or "almost always" at home were classified as having LOI=L1 in the UIS dataset and those who responded with "sometimes" or "never" were not. However, that most Singaporean students identified as experiencing linguistic discordance speak their LOI "sometimes" at home means that they have some expressive ability in English and a likely higher receptive ability in it, which will mediate their learning of/in English (the L2?) at school. Beyond this specific case, one could imagine a similar situation with varying "dialects" inside and outside the classroom, with students having some proficiency in the classroom's dialect (of their L1) that could support their learning. More importantly, what the Burundi and Singapore cases reveal is that RLD offers only a rough estimate of the match between LOI and the linguistic resources students bring to school. These cases also make clear that more nuanced data are needed to understand what the medium/media of instruction is/are in a given site, including the language(s) of textbooks, language use by teachers and peers, and how these differ across subject areas. It is also important to consider the status afforded to different languages by such usage and allocation, as well as the social status of different languages in the schooling and societal contexts in which instruction and learning take place.

6. Conclusion

This study's findings reveal a very strong, positive correlation between poor basic literacy outcomes and the presence of a mismatch between the languages of home and schooling, controlling for country income. They reinforce findings of prior research at both country and regional levels, underscoring the importance of increasing agreement between the languages of students and those of schooling, particularly the language of instruction. This agreement has been shown to improve learning outcomes as well as access to education and student retention. The current study shows how the presence of what I termed "linguistic discordance" is associated with poor basic literacy outcomes, which will likely extend to poor access to education overall. My findings emphasize the necessity of prioritizing issues concerning linguistic discordance in policy and research, including longitudinal research and robust data collection. Additionally, immediate targeted policies that increase the match between students' home and schooling languages should be taken, considering plausible outcomes specific to different locations based on existing relevant research—both local and comparative.

While the importance of the language of instruction issue has been highlighted in relation to African countries, and low-income countries in general (Abadzi, 2006, 50–57; Brock-Utne, 2014), this study emphasizes the need for serious attention to this phenomenon across country-income groups. Considering that the association between Learning Poverty and the prevalence of linguistic discordance is most pronounced in middle-income countries suggests that policy interventions promoting LOI=L1 in these contexts could yield the most improvements in basic literacy outcomes compared to other settings. This emphasizes the need to prioritize language-in-education policy-making, interventions, and research particularly in these countries for progress toward achieving "Sustainable development Goal 4: Quality Education" by 2030. My findings also point to the inadequacy of combining and generalizing across low- and middle-income countries in LOI-related literature, which is often the case (e.g. Nag et al., 2019; WB, 2021).

This study methodologically advances the existing literature on LOI by providing a comparative perspective across 56 countries—an unprecedented empirical breadth in this field. Leveraging newly curated datasets by the WB and UIS, the study utilizes LOI data that is based on

input from individual students, which allows it to a) offer a more nuanced reflection of linguistic discordance at the country level compared to broader regional or national measures; and b) uniquely include countries with varying linguistic diversity, from Japan and Poland to Canada and Indonesia. Moreover, by delving into Burundi and Singapore as data outliers, where the correlation between the rates of linguistic discordance and Learning Poverty defies expectations, the study deepens contextual understanding of the phenomenon under investigation as well as in relation to LOI data collection. Furthermore, it underscores the need for looking into local contextual factors beyond general trends. Finally, my findings and analysis do not undermine the value of learning (*of*) an L2 in addition to L1, but instead highlight how teaching across the curriculum *in* L2 could be detrimental to basic literacy outcomes and the ensuing benefits and rights education provides to children and their communities.

CRediT authorship contribution statement

Alkateb-Chami Maya: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ijedudev.2023.102975.

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