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Rising access and falling outcomes: educational change and the GEQIP reforms in Ethiopia

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Abstract

Purpose – This paper explores the extent to which the period 2012–2021, when the General Education Quality Improvement Programme (GEQIP) reforms to primary education were implemented in Ethiopia, is one of educational improvement, despite the absence of gains in learning outcomes. It examines trends in access, learning progress in Grade 4 school quality and in equity of access and outcomes across regions and between urban and rural contexts.

Design/methodology/approach – Data from several sources are employed including Ethiopian national education data (Education Management Information Systems (EMIS)) and longitudinal school survey data from the Young Lives (YL) and Research on Improving Systems of Education (RISE) projects. Analysis employs descriptive analysis and regression modelling in a value-added framework. Trends in learning outcomes in mathematics and pupil backgrounds are examined alongside school quality, its measures and predictors.

Findings – Access to primary education in Ethiopia has expanded significantly, with some equity improvements. Learning outcomes have declined in most regions, in Southern Nations, Nationalities and Peoples (SNNP) from a mean score of 515 in 2012 to 436 in 2020. Several school and teacher quality indicators targeted by GEQIP improved modestly, including teacher maths scores which improved from a mean of 462 to 507. Improvements have not been sufficient however to outweigh effects of rapid expansion and rising disadvantage, perhaps worsened by shocks including COVID and conflict.

Originality/value – This research contributes to understanding the role of the GEQIP reforms in improving primary education in Ethiopia. It may inform policy on targeted education quality improvement. It informs wider debate on the "learning crisis" especially in sub-Saharan Africa.

Keywords Reform, Ethiopia, Education, Learning outcomes, Value-added, GEQIP

Paper type Research paper

1. Introduction

Improving the effectiveness of education systems in low- and middle-income countries (LMICs) is crucial to address the global "learning crisis"; that is the persistence of low learning outcomes despite expansions in access. It is essential to ensure that young people leave school with learning outcomes which meet 21st century expectations, whether in the narrower terms of basic literacy and numeracy or more broadly, including skills such as communication,

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collaboration and critical thinking. Many LMIC education systems, however, are undergoing re-orientation away from serving relatively more advantaged groups towards a mass system accessible to all. In this transition, declining learning outcomes can be observed in many contexts, including Ethiopia (NEAEA, 2020). However, across a range of contexts in South Asia and sub-Saharan Africa, even where enrolment has been high for decades, improvements in learning have typically been limited (Angrist, Djankov, Goldberg, & Patrinos, 2021). Static or falling learning outcomes in contexts of high enrolment raise questions about school quality. Even in OECD countries, improvements in some learning outcomes have been elusive in recent years, with no gains in OECD average PISA scores being observed since 2009 (OECD, 2023).

Ethiopia has made strong progress in improving educational access, especially at primary level and since the end of civil war in 1991. Unlike several other countries in Africa, Ethiopia did not experience a short-term "big bang" expansion of access to primary schooling following the one-time introduction of free education policies. A commitment to free primary education was made by the *Derg* [1] in 1976, but expansion was limited and by the early 1980s rates stagnated then began to fall to a low in 1991. Thereafter, enrolment rates improved steadily, especially following the elimination of fees in 1995. However, rates rose initially in the more developed regions and have risen dramatically in the less populated "emerging" regions only in more recent years.

Persistent and longstanding challenges remain in Ethiopia in terms of educational quality, resources, efficiency and equity. While achievement is generally weak, with 90% of children aged 10 being unable to read and understand a simple text (UNESCO, 2024), achievement gaps are large between more and less developed (especially pastoralist) regions and between urban and rural areas (Sanfo & Ogawa, 2021). Progression to higher levels of education is uneven (Woldehanna & Araya, 2016). Resources are very limited, with implications for quality. Data on expenditure per pupil in primary schools may be employed as a simple proxy measure for quality. In 1997, Ethiopia is estimated to have spent 18.81% of per capita gross domestic product (GDP) per pupil in primary education, while this figure was 7.88% in 2015 (World Bank, 2024). In terms of constant 2015 US Dollars [2], this equates to $49.50 in 1997 and a remarkably similar, but notably low, $49.67 in 2015.

In recent years, new challenges, notably COVID-19, climate-related environmental disasters and renewed internal conflict have threatened to derail progress and widen inequalities further (Tiruneh, 2020a, b; Yorke, Rose, Woldehanna, & Hailu, 2021). In 2024, Ethiopia's education system faced serious disruption and crisis, with at least 8 million children out of school (UNICEF, 2024) because of emergencies including drought and flooding as well as effects of current or recent conflict, such as damaged school infrastructure, displacement, food-shortages and an unmet need for psycho-social support. Conflict has affected schooling in regions including Tigray, Amhara, Afar, Somali and Oromia. At the same time, ambitious reforms to improve access, quality, equity and outcomes have been implemented, under challenging conditions. Notable among these is the General Education Quality Improvement Programme (GEQIP), begun in 2008 and completed in 2022. In this paper, we examine the puzzle of large-scale reforms and investment in primary education being accompanied by declining learning outcomes. Our research question is:

> To what extent is the period of the GEQIP reforms one of educational improvement in Ethiopia, despite the absence of gains in average learning outcomes?

We make use of a unique dataset comprising three linked longitudinal school surveys conducted by the Young Lives (YL) study [3] and by Research on Improving Systems of Education (RISE) Ethiopia [4] between 2012 and 2021, to examine trends in learning outcomes and pupils' backgrounds and their relationship to school quality. We examine whether the period of GEQIP reforms since 2012 has been associated with educational improvements, albeit without improvements in outcomes.

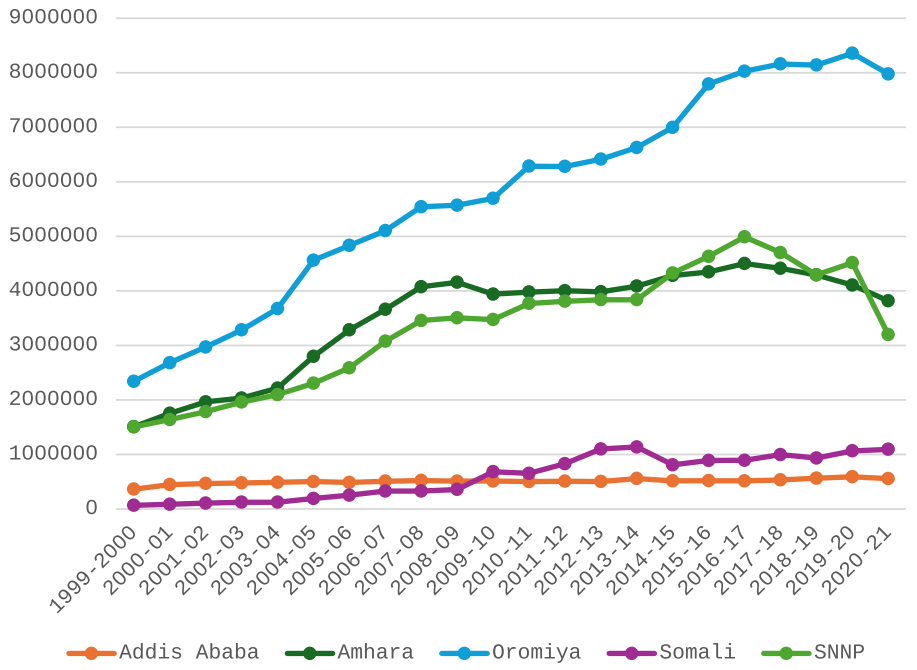
First, for illustrative purposes, we make use of national Education Management Information Systems (EMIS) data to shed light on improvements in access and equity which have been achieved despite falling learning outcomes as illustrated in Figures 1 and 2 below. Increases in enrolment in Ethiopia have taken place in an environment of rapid population growth. Ethiopia's population stood at 47.9 million in 1990, with 46% being aged under 15 years old, while in 2020, the population was 114.9 million with 40% under 15, so that the youth population more than doubled (UIS, 2024). Adult literacy rates stood at 27.01% in 1994 and 51.77% in 2017, representing close to a four-fold increase in the total number of adult literates, given the expanding population. Youth literacy (age 15–24) improved from 54.8% in 2011 to 72.8% in 2017 (UIS, 2024).

The national-level primary net enrolment rate was 21.9% in 1995, 40.3% in 2000, 61.2% in 2005, 74.4% in 2010 and 85.6% in 2015 (UIS, 2024). Given population growth, these statistics indicate very large increases in primary school populations. Figure 1 illustrates the total enrolment trends for the regions included in the YL and RISE surveys, since 1999. Results are dominated by the Oromia region which has the largest primary school population and steady growth (from 2.3 to 8.0 million) throughout the period. Proportionally, growth was highest in the Somali region.

2. Literature review

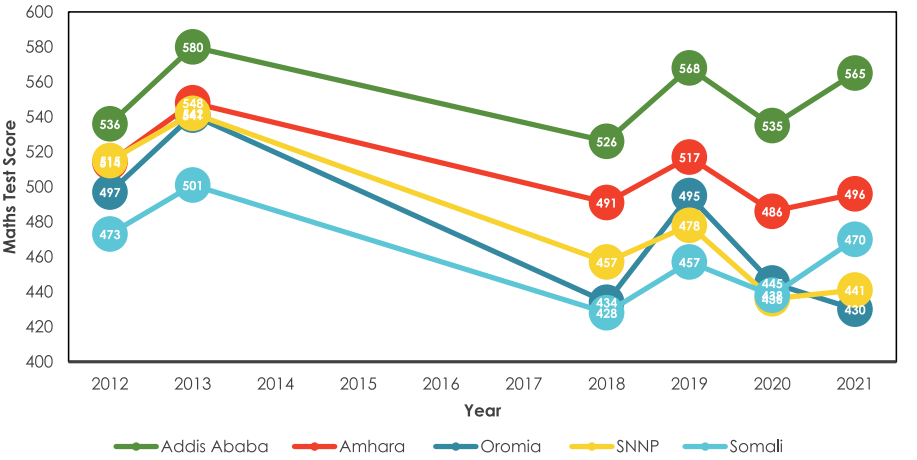
2.1 Education reform in Ethiopia

Access to basic education has expanded dramatically in Ethiopia since 1994 (Ministry of Education, 2019), benefiting disadvantaged groups and those in relatively less developed or "emerging" regions. Iyer, Rolleston, Rose, and Woldehanna (2020) show that the composition



Source(s): Authors' computations from MoE statistical abstracts (1999-2021)

Figure 1. Total primary enrolment by region in Ethiopia 1999–2021



Source(s): Authors' computations using YL and RISE survey data

Figure 2. Trends in learning outcomes in mathematics 2012–21 (33 common schools)

of the group of children in-school has shifted such that many more are "first generation learners" than previously, increasing pressures on the system. The Ethiopian government has prioritised education in its Education Sector Development Plans (ESDPs) and its flagship GEQIP Programme. The latter aims to address quality and equity concerns arising in the wake of rapid expansion. The GEQIP reforms began implementation in 2008 and have proceeded in three phases – GEQIP I (2008–12), GEQIP II (2012–18) and GEQIP-E (2018–22). The overall goal of this programme is to improve learning outcomes and school completion rates equitably by enhancing teaching and learning conditions in schools and strengthening educational institutions and service delivery (World Bank, 2008). The reforms have been implemented nationwide and are relatively comprehensive (World Bank, 2008, 2013, 2017), including a wide range of interventions from classroom-building and provision of textbooks to disbursing school grants. The programme has notably augmented the teacher workforce and expanded training (World Bank, 2017).

GEQIP-I and GEQIP-II reforms focused on providing essential inputs to teaching and learning, such as increasing the supply of qualified teachers, providing continuous in-service training to for teachers and funding school improvement plans through per capita school grants (World Bank, 2008, 2013). GEQIP-II also focused on ICT. Building on the strengths and challenges of GEQIP-I and GEQIP-II, GEQIP-E aimed to improve the quality of general education with an explicit focus on equity, aiming to provide all children with the opportunity to reach their full potential regardless of gender, socio-economic background or where they live (World Bank, 2017).

2.2 Educational access and the learning crisis in Ethiopia and in low and middle-income countries

The World Bank Group, United Nations Children's Fund, Foreign, Commonwealth & Development Office, United States Agency for International Development & Bill and Melinda Gates Foundation (2022) estimate that across LMICs, as many as 70% of 10-year-olds were unable to read and understand a simple written text in 2022, an increase from 57% before the COVID-19 pandemic. LMICs face great many challenges in raising learning outcomes or reducing "learning poverty", especially where enrolments are rising and where inequality is significant. In such contexts, expansion in access likely involves increasing numbers of

disadvantaged pupils entering schools, whose prior learning may be weak. Rapid expansion presents major challenges to education systems, schools and teachers, which have been particularly acute in sub-Saharan Africa, where large class-sizes and resource shortages are commonplace. Angrist *et al*. (2021) examine both enrolment and outcomes trends globally (for 164 countries) over the period 2000–2017 using "harmonised test scores" and find that progress in learning is very limited, not least in sub-Saharan Africa. On the question of whether slow progress in learning is despite or in part because of surging enrolment, Angrist *et al.* (2021) argue that the "despite" interpretation has support in that the issue is similar for countries where enrolment has been high and stable.

However, Filmer (2023) shows that "rapid scale up" in terms of expansion of primary schooling, linked especially to large-scale hiring of teachers in the wake of free primary education policies can lead to declining learning outcomes, which were found to be detectable 5 to 16 years after the reforms were implemented. His analysis relies on data from Kenya, Madagascar, Mozambique, Tanzania, Togo and Uganda. The decline in outcomes was larger on average for language than mathematics but was found in relation to teachers' skills as well as pupils' skills in mathematics.

Nonetheless, concerns about declining outcomes in periods of expansion may need to be set against potentially wider social benefits of increasing access. Chicoine (2019) examined the impact of the removal of primary school fees in Ethiopia, which led to significant increases in enrolment, using (Demographic and Health Surveys (DHS) data. He found that fee elimination led to an increase in schooling of 0.7 years on average plus important benefits in terms of overall literacy and health knowledge. He argues that while it is important to maintain education quality, this should not be at the expense of widening access, including because of these important social benefits. At the time of fee elimination, average years of schooling in Ethiopia stood at a low level of 2.5 years, and Chicoine argues that additional years of schooling may have a large effect on literacy when starting from this low base, even in the presence of quality concerns.

Kaffenberger, Pritchett, and Sandefur (2018) address a similar issue, also making use of DHS data but from 54 countries, including Ethiopia. They examine the effects of achieving six years of schooling *and* acquiring literacy on fertility and child survival. They show that these benefits are very large when conditional on achieving literacy, but even when literacy is not achieved, the effects of schooling on social outcomes are sizeable. Achieving literacy is found to account for up to half of the total benefits, but results suggest that schooling also confers important benefits in other ways, such as through socialisation. Like Chicoine's study, their analysis also makes a strong case for widening access despite quality concerns. Kaffenberger *et al.* (2018) show that predicted gains in literacy from six years of schooling in Ethiopia lie close to the mean among the countries examined.

Le Nestour, Moscoviz, and Sandefur (2022) investigate changes in "education quality" over the long term – between 1950 and 2000 using DHS and Multiple Indicator Cluster Survey (MICS) data and reveal a less encouraging finding in Ethiopia. They define "quality" in terms of literacy conditional on completing five years of schooling, similarly to Kaffenberger *et al.* (2018), and analyse differences between birth cohorts for 87 countries, showing that the probability of being literate after 5 years of schooling has stagnated or declined globally, with some of the steepest declines being observed in South Asia and sub-Saharan Africa. Moreover, Ethiopia's decline is very sharp. They argue that changes in the composition of pupil cohorts can only explain a part of this decline and note that the decline is observed in many contexts before policies to abolish fees were implemented, although decline is shown to have accelerated following free primary education policy implementation.

2.3 Trends in learning assessment data in Ethiopia

Ethiopian Ministry of Education (MoE) data including from National Learning Assessments (NLA) show declining outcomes in Grade 4 between 2000 and 2011, improvement between 2011 and 2015 and decline again between 2015 and 2019, both in terms of composite and

mathematics scores (Iyer *et al.*, 2020; Tiruneh, Hoddinott, Rolleston, Sabates, & Woldehanna, 2021; NEAEA, 2020). Further, in all these assessments, a high proportion of students perform at "below basic" levels (Iyer *et al.*, 2020). Oketch, Rolleston and Rossiter (2020, p. 6) show that levels of learning outcomes in Ethiopia in the YL study in 2012/12 (Grades 4 and 5) and in 2016/17 (Grades 7 and 8) were very far from national curriculum expectations. In the second case, a majority of pupils were found to be at least three school years behind, i.e. working at a level closer to Grade 4 than Grade 7. More recently, the MoE (2019) reported that only 21.9% of Grade 4 students (and 11.1% of Grade 8 students) achieved target learning levels set by the fifth ESDP.

Tiruneh, Sabates, Rolleston and Hoddinott (2022) compared learning outcomes data from RISE Ethiopia for Grade 4 in 2018–2019 to data from the YL survey cohort in the same grade in 2012–2013. This comparison shows a decline in average levels of achievement over time. The pattern remains when comparing directly across the 33 schools that appear in both samples; and when employing propensity score matching to balance the two groups, given the changes in pupil composition in these schools over time (see Araya *et al.*, 2023). Tiruneh *et al.* (2022) show that outcomes in the common schools declined by an amount equivalent to around one year of schooling, i.e. average learning gain in Grade 4, despite improvements in most indicators of school infrastructure and teacher quality. This is also despite improvements in certain pupil-level indicators such as pre-school access and absence rates. However, pupils in-school were more disadvantaged on average where home assets and parental education are concerned by 2018–2019 than in 2012–2013, indicative of continuing compositional change in school entry linked to access improvements. Nonetheless, declining outcomes are observed even when controlling for these compositional changes, suggesting declining school quality or perhaps negative peer effects in the changing classroom setting.

Low levels of learning outcomes in Grade 4 must in some sense be the result of shallow learning "profiles" or growth trajectories in earlier grades (see, Kaffenberger & Pritchett, 2021), although relatively little evidence is available to examine this in Ethiopia. Evidence for grades below Grade 4 points towards low levels of outcomes, including from the Early Grade Reading and Mathematics Assessments (EGRA and EGMA) (see USAID, 2010; 2019). In the most recent EGRA study, 59.5% of pupils in Grades 2 and 3 combined were considered unable to read at even the most basic level (NEAEA, 2022), representing a deterioration since the previous round of this exercise (in 2018), although there are some differences in sampling. More generally, EGRA results show little improvement overall since 2014 (NEAEA, 2022). In relation to EGMA, results from 2014 and 2018 show almost no change overall either in Grade 2 or 3 (NEAEA, 2018). While data available for the purposes of assessing learning over the period of the COVID pandemic are very limited, available studies suggest that this period has seen further decline in outcomes in many parts of Ethiopia (see, Araya *et al.*, 2023; Kim, Rose, Tiruneh, Sabates, & Woldehanna, 2021).

2.4 Trends in school and teacher quality in Ethiopia

Recent studies do not, however, suggest that declining school and teacher quality are necessarily a major explanation for deteriorating learning outcomes. Indeed, there is evidence in support of school improvement in terms of key observable indicators. Tiruneh *et al.* (2022) show that when comparing the 33 common schools mentioned above between 2012 and 2019, there are improvements overall concerning the availability of pedagogical resource centres, computers and internet access, full-day shift operation as opposed to half-day, library and toilet facilities. Moreover, improvements were particularly notable in rural areas. At teacher-level, the proportions of qualified and specialist (mathematics) teachers improved alongside teachers' mathematics content knowledge and access to in-service training. At the same time, expansion in the teacher workforce meant that teachers were on average notably younger and less experienced by 2019.

While longitudinal evidence on learning progress in Ethiopia is scarce, there is little to suggest a decline in learning progress during Grade 4 over time specifically, despite a decline in outcomes overall. Learning progress on average within Grade 4 in the RISE study was not lower than in YL (see Tiruneh *et al.* (2022)). Notably, pupils in emerging regions, rural areas and those with lower levels of home assets "caught up" slightly their more advantaged peers by making slightly more progress during the school year in 2018–2019. While this narrowing of gaps may be considered an equity improvement in one sense, however, it should be remembered that learning progress in 2018 was from a lower base.

In this paper, we contribute to the literature on trends in learning outcomes and pupils' backgrounds by extending the period for which analysis is available to 2021, including reference to the period of the COVID-19 pandemic. We also present data for the extended period on teacher mathematics content knowledge. We contribute to the literature on school and teacher quality as predictors of learning outcomes and progress by augmenting the descriptive analysis available by conducting regression analysis.

3. Methodology

We employ data from three closely linked longitudinal school survey exercises conducted by YL and RISE. YL collected data in 2012–2013, while RISE collected data in 2018–2019 and again in 2020–2021. The school surveys collected data including learning outcomes assessment results at the beginning (baseline) and end of the school year (endline). We complement our analysis using these data with descriptive analysis of available national data on enrolments, contextualised with population and literacy data.

YL is a longitudinal study of childhood poverty which has collected data in Ethiopia since 2002, conducting two large school surveys – of Grade 4 and 5 pupils in 2012–2013 and Grade 7 and 8 pupils in 2016–2017. We make use of the data from the Grade 4 survey, given that Grade 4 data are also available from two later RISE surveys. The YL Grade 4 survey was conducted in 30 purposively selected sites in seven regions of Ethiopia, namely Addis Ababa, Afar, Amhara, Oromia, Southern Nations, Nationalities and Peoples (SNNP), Somali and Tigray. It collected background data on almost 12,000 pupils in 94 schools plus repeated measures of learning outcomes (mathematics and reading comprehension). Teacher and principal questionnaires were administered alongside an assessment of mathematics teachers' subject knowledge. A total of 5,100 Grade 4 students from 142 classes took the mathematics tests both at the beginning and end of the school year. Full details of the survey are available in Aurino, James, and Rolleston (2014).

RISE followed largely the same design, using very similar instruments. RISE extended its survey to Benishangul-Gumuz but did not include Afar. In 2020/2021, RISE returned to most of the same schools as in 2018–2019 shortly after reopening following the coronavirus "lockdown". Owing to security concerns at that time, no data were collected in Tigray or in a small number of schools in Oromia and Benishangul-Gumuz. Also, data on schools and teachers were not collected except on teacher mathematics knowledge. In both RISE surveys, this test contained a reduced set of items selected from the original YL test (20 out of 30). A total of 3,353 Grade 4 pupils in 166 schools participated in RISE 2018–2019 and 3,574 pupils in 138 schools in 2020–2021. Details of the RISE surveys and its sample are available in Hoddinott, Iyer, Sabates, and Woldehanna (2020), Tiruneh *et al.* (2021) and in Araya *et al.* (2023).

Numeracy test scores for Grade 4 pupils are derived from linked mathematics (Iyer *et al.*, 2020; Tiruneh *et al.*, 2022; Todd & Wolpin, 2003; Hoddinott *et al.*, 2020) assessments administered across the surveys. The original YL 2012 baseline assessment included 25 multiple-choice items, while the endline test included 19 common items and six new items. The RISE tests in 2018–2019 and 2020–2021 were identical and were selected from the YL 2012–2013 items, taking account of changes in curricula. They included 15 common items at baseline plus 10 new items at endline. This approach allowed for concurrent calibration using

item-response modelling to create a common interval-scale. Outcomes are reported on the common test scale centred on 500 with a standard deviation of 100 (one year's average learning progress is 30 points in the YL sample). Details are available in Tiruneh *et al.* (2021, 2022). Appendix Table A2 summarises the learning outcomes data.

The RISE 2018–2019 sample of 166 schools and 2020–2021 sample of 138 schools includes 33 schools that had been sampled by YL in 2012–2013. These were selected from the schools in the six regions common to both surveys in order to explore the way in which GEQIP-II reform indicators of school resources (e.g. student-textbook ratio, access to electricity, computers, library, etc.) and pedagogical supplies (e.g. teacher content knowledge, teacher's training qualification, principal's education level, etc.) may have changed over six years between 2012–2013 and 2018–2019. The YL mathematics tests were administered at the start of the implementation of GEQIP-II reforms while the RISE Ethiopia 2018–2019 tests were administered right after the end of GEQIP-II reforms. Table 1 presents a summary of the YL 2012–2013, RISE 2018–2019 and 2020–2021 full samples.

While the organisation of the roll-out of GEQIP and the lack of detailed information on implementation does not allow for robust evaluation of impact, it is possible to consider the extent to which the patterns and trends identified are consistent with the aims and success of GEQIP. We employ a combination of descriptive analysis and regression modelling. We provide descriptive analysis to address patterns and trends in learning outcomes which builds on evidence from earlier studies (Oketch, Rolleston, & Rossiter, 2021; Tiruneh *et al.*, 2022), adding analysis of new data (RISE 2020–2021) to develop a longer-term comparison (2012–2021) than was previously possible. To examine school quality, we conduct value-added analysis to provide summary estimates of school quality but begin with a simple ordinary least squares (OLS) regression exercise to examine partial correlations between school and teacher quality variables and numeracy endline outcomes, conditioning on baseline scores. These are explored in the light of GEQIP as a number of these variables represent indicators the programme was intended to address.

The RISE 2020–2021 survey did not collect new data on school and teacher quality except for the re-administration of the teacher mathematics content knowledge test, which we report in the findings in longitudinal perspective. Moreover, the period of this survey was affected by the coronavirus pandemic so may be considered anomalous in that schools were often closed or suffered poor attendance. Accordingly, while we include this survey in our presentation of

Table 1. School and pupil samples across 2012–13, 2018–19, and 2020–21 surveys, by region

		2012–13 Number of schools	Number of pupils	2018–19 Number of schools	Number of pupils	2020–21 Number of schools	Number of pupils
Region	Addis Ababa	12	1,093	20	464	20	540
	Amhara	13	578	25	516	25	662
	Benishanul-Gumuz[a]	–	–	19	371	14	384
	Oromia	8	494	41	848	37	905
	SNNP	20	1,146	22	434	22	581
	Somali	19	586	19	279	20	502
	Tigray[b]	13	723	20	441	–	–
	Afar[c]	9	480	–	–	–	–
	Total[d]	94	5,100	166	3,353	138	3,574

Note(s): [a]Benishangul-Gumuz region was not included in the YL 2012–13 school survey
[b]Tigray region was not included in the RISE Ethiopia 2020–21 survey
[c]Afar region was not included in the RISE Ethiopia 2018–19 survey
[d]The total numbers indicated include only those participants who took both baseline and endline tests
Source(s): Young Lives 2012–13; RISE Ethiopia 2018–19 and 2020–21

descriptive analysis, we omit it from the regression analyses owing to the difficulty in interpreting results for this period given the significant "shock" of the pandemic. We are not able to interpret results causally in relation to GEQIP, given the lack of exogenous variation in these indicators. We calculate value-added estimates for schools using a lagged test-score model as described below to analyse the contributions made by schools and to identify which pupils have access to higher-quality schools.

The "value-added" approach employs a "lagged-score" model which allows us to predict the contribution schools make to endline scores conditioning on baseline scores and backgrounds (see, Todd & Wolpin, 2003; Goldstein, 1997; Perry, 2016). This approach differs from the standard "education production function" approach in that it does not estimate the effects of specific school and teacher characteristics but draws attention to the relative benefit of a pupil belonging to a particular group such as a class or school by comparison with others (see Scheerens, Glas, & Thomas, 2003; Oketch *et al.*, 2021). The baseline (lagged) score may be understood to represent not only the prior achievement of a pupil but also this score absorbs the effects of prior educational inputs including home inputs and the quality of previous education. Use of the lagged score mitigates concerns regarding endogeneity and selection biases because it captures at least part of these prior influences. The approach does not eliminate such concerns, however, even when rich data on student backgrounds are included in the model, given that unobserved differences between school populations, in terms of motivations for example may be absorbed into "school effects". Equally, potential serial correlation across regression residuals may be a source of bias in value-added models. However, these issues may be considered more problematic where value-added models are employed for purposes such as school or teacher accountability or to inform school choice, i.e. where precision of individual school value-added estimates is paramount rather than the examination of broader patterns. We employ a simple two-level multi-level (hierarchical linear) model with school random effects (u_j). In the analyses, we focus on value-added estimation which is conditional on both prior achievement and student background characteristics which we term "contextual value-added" but also, for comparison, present estimates from unconditional value-added models which include only prior achievement as an only explanatory variable at pupil-level (see Rolleston & Moore, 2018). The model estimates the endline score ($T_{ij,t}$) for the ith student in the jth school as a function of the baseline ($T_{ij,t-1}$) plus a vector of student characteristics at baseline (X), a school-effect (u_j) and an individual (student) level error-term (η) as below:

$$T_{ij,t} = \alpha T_{ij,t-1} + \gamma X_{ij} + u_j + \eta_i$$

We examine the characteristics of "high" and "low" value-added schools descriptively, including in terms of their pupils and teachers, by comparing the top and bottom third of schools in the value-added distribution. Table 2 presents the list of variables for both the unconditional and contextual value-added approaches we employ in the value-added estimate models.

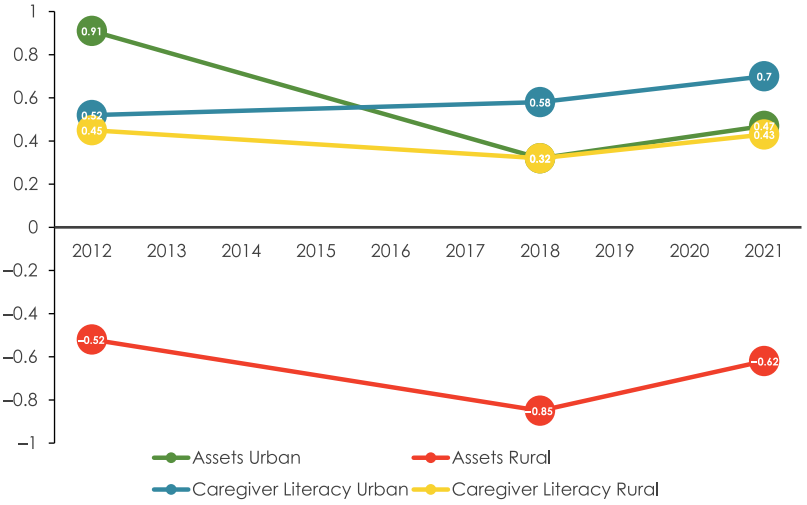
4. Findings

4.1 Trends in learning outcomes and student backgrounds

Trends in learning outcomes between 2012 and 2021 can be usefully examined in relation to the common 33 schools included in both the YL and RISE surveys. The same pupils are included in each baseline-endline pair (2012–2013; 2018–2019; 2020–2021) but in the intervening period only the schools remain in common. Figure 3 presents the results by region, remembering that the schools are not a representative selection. In all the regional groups of schools, mathematics learning levels fell from 2018 to 2020 after having fallen previously between 2012 and 2018. Levels of learning outcomes in 2021 broadly reach those of 2012 only in Addis Ababa and Somali. Pupils' learning outcomes in many regional samples declined notably, especially in Oromia and SNNP, presenting a potentially significant challenge for teachers.

Table 2. List of variables used in the regression model for value-added estimates

Variable type	Unconditional value-added	Contextual value-added
Outcome variable	Test score at the end of a school year	Test score at the end of a school year
Explanatory variable	Test score at the start of a school year	Test score at the start of a school year
		Student background variables
		Age
		Gender
		Preschool attendance
		Ever having dropped out
		Number of days absent in current school year
		Primary caregivers' literacy
		Biological mother alive
		Biological father alive
		Household asset possession index



Source(s): Authors' computations using YL and RISE survey data

Figure 3. Trends in Caregiver literacy and household assets by urban and rural location

To put the trends in learning outcomes in context, we examine trends in pupils' household assets and caregiver literacy levels. Figure 3 illustrates the results, and Appendix Table A1 summarises the data on key pupil background indicators which show a rise in ever-attendance at pre-school over the period from 47% to 56% as well as significantly higher absenteeism in 2020–2021, linked to the pandemic. Between 2012 and 2018 pupils' household asset levels declined on average, indicating a shift in the composition of school populations towards more disadvantaged groups. There was some recovery of average household asset levels between 2018 and 2021. Figure 3 illustrates the trends separating urban and rural locations and shows the trend in levels of caregiver literacy. In rural areas, average caregiver literacy reached its lowest point in 2018 then began to improve but was steadily increasing across the period in urban areas.

4.2 Teacher and school quality

The RISE survey in 2020–2021 administered a teacher mathematics test as did the two previous surveys. Table 3 reports the results from all three surveys for comparison, providing

Table 3. Teacher math content knowledge for the 2012–13, 2018–19 & 2020–21 common school cohorts, by rural-urban location

	2012–13 Full (n = 25)	Rural (n = 13)	Urban (n = 12)	Diff.	2018–19 Full (24)	Rural (13)	Urban (11)	Diff.	2020–21 Full (20)	Rural (11)	Urban (9)	Diff.
Teacher maths content knowledge (mean and standard deviation)	462 (79)	438 (64)	488 (87)	50.0	501 (69)	504 (56)	499 (84)	−5.0	507 (54)	506 (57)	509 (54)	3.0

Source(s): Authors' computations using YL and RISE survey data

an update to Tiruneh *et al.* (2022) and Todd and Wolpin (2003). In rural areas, particularly, teacher test scores improved markedly between 2012–2013 and 2018–2019, remaining stable with a slight improvement by 2019–2020. This period was characterised by large-scale teacher recruitment, with average qualifications and training rising notably. These improvements are certainly consistent with the aims of GEQIP and will in many cases have been the direct result of the GEQIP reforms.

We examine the extent to which key teacher- and principal-level factors and school resources are associated with students' endline mathematics scores for the 33 common schools using a simple OLS model which pools the YL and RISE (2018–2019) data (these data were not collected in RISE 2020–2021). We first estimate predictors of mathematics performance at the end of the school year, conditioning on beginning of school year mathematics test scores, key student background, and key teacher and principal characteristics (Table 4, Model 1). Secondly, we introduce school-level indicators to augment the model (Table 4, Model 2).

In Model 1, teacher-level characteristics including being younger, having specialised training in mathematics and participating in a continuous professional development program are positively and significantly associated with higher pupil mathematics outcomes at endline, conditioning on baseline scores. Other key teacher characteristics including mathematics knowledge, education level, gender and teaching experience are not significantly associated with endline scores. Among the principal characteristics, experience is positively and significantly associated with higher pupil endline scores in mathematics. In Model 2, full-day shift schools (as opposed to half day), having a radio and having a functional pedagogical resource centre, are positively and significantly associated with higher student outcomes in mathematics. Other GEQIP-II-related school indicators including student: textbook ratio, school grant, number of working computers and access to the internet are not significant predictors of outcomes, while a functional library is negatively associated with outcomes. The co-efficient for the dummy variable for the RISE 2018–2019 cohort was not found to be a significant predictor of outcomes, indicating that learning progress does not differ significantly between the cohorts.

4.3 High and low value-added schools

To better understand the characteristics of high and low value-added schools in Ethiopia, we compare schools in the top and bottom tercile of the school value-added distribution for the common 33 schools. We use contextual value-added in order to take account of the different groups of pupils schools serve. Table 5 reports the results. The numbers of schools are relatively small in each group, but there are some notable differences between the high and low VA schools. In both cohorts, higher scoring pupils at baseline and those with more economically advantaged backgrounds attended higher VA schools, but the gap shrinks substantially between the two surveys. High VA schools were much more likely to teach for a full-day, especially in the YL sample and were more likely to be urban schools. Perhaps most notably, high VA schools were more likely to have teachers who had specialised in mathematics and with notably higher scores in the teacher mathematics test.

5. Discussion and conclusions

GEQIP aimed to improve learning outcomes by enhancing conditions, strengthening institutions and improving education service delivery. Unfortunately, there is little evidence to suggest improvements in average learning outcomes. In some regional samples, especially Oromia and SNNP, average outcomes have declined notably and pupils' competency levels in mathematics had declined by 2021 from 2012 levels. The "learning crisis" may also be understood, however, in terms of access to learning opportunities. In this sense, much progress has been made. Strong improvements in literacy rates and growth in the total number of literate youths and adults have been accompanied by significant expansion in the primary school population from 11.9 million to 15.3 million pupils in Grades 1–4 between 2012/2013 and

Table 4. Teacher, principal and school characteristics and progress in mathematics

	(Model 1) Math end-of-year score	Std error	(Model 2) Math end-of-year score	Std error
Prior performance (baseline math score)	0.756***	(0.018)	0.736***	(0.019)
RISE/YL cohort: RISE 2018–19 (ref group: YL, 2012–13)	−4.601	(4.118)	−4.841	(4.499)
Other child-level controls[a]	YES		YES	
Teacher/Principal characteristics				
Teacher sex: Male	−6.691	(4.261)	−5.771	(4.860)
Teacher age	−1.216***	(0.360)	−1.698***	(0.428)
Teacher level of education: Diploma/ University degree (ref group: certificate)	1.820	(4.665)	−13.17*	(6.377)
Teacher specialised in mathematics	10.32*	(4.471)	3.172	(6.312)
Teacher participation in CPD training: Level 1 training (ref group: no training)	27.97***	(6.811)	16.03**	(7.866)
Level 2 training	22.29***	(5.987)	6.667	(7.218)
Teacher math content knowledge	−0.0154	(0.026)	−0.0654	(0.031)
Teacher teaching experience: University degree (ref group: post-grad diploma or below)	0.334	(0.427)	0.445	(0.514)
Principal's experience	1.040*	(0.508)	−0.691	(0.996)
School resources				
Student: textbook ratio (ref group: 4 or more students share a book)				
3 students share a textbook			4.832	(10.64)
2 students share a textbook			3.566	(11.00)
Each student has his/her own textbook			−7.556	(8.354)
School received funding from school grant			−1.881	(11.66)
Number of classrooms in the school			−0.346	(0.352)
Full-day shift school			15.86**	(9.437)
Functional library			−32.26***	(9.098)
Working computers			0.647	(0.551)
Functional Internet			3.308	(10.33)
Radio			19.09**	(6.489)
Functional pedagogical resource centre			12.58**	(4.423)
Source of drinking water (ref group: No source of drinking water): Unprotected water			3.683	(8.713)
Protected water			−0.588	(17.24)
Clean Piped water			15.35	(9.774)
Number of working toilets for students to use			0.597	(0.505)
Constant	173.9***	(21.53)	250.5***	(35.24)
Observations	2,250		2,250	

Note(s): *$p < 0.1$, **$p < 0.05$, ***$p < 0.001$; Robust standard errors in parentheses

[a]Child level controls included are: Gender, age, biological mother alive, biological father alive, preschool attendance, child ever dropped out of school, number of days absent in class, primary caregiver literacy, and household asset index

2020/2021 (MOE 2012/13, 2020/21). Moreover, expansion has been proportionately greater in more disadvantaged regions, especially Somali, so that there have also been notable improvements in equity of access. In some sense, however, the learning crisis in such regions has shifted from an "out of school" to an "in school" challenge.

As a result of more rapid expansion in economically less-developed regions such as Somali, change in the composition of schools and classes was also more rapid. Increasingly

Table 5. Characteristics of high and low value-added schools comparison

Characteristic	Young lives 2012–13 High value-added schools (A)	Low value-added schools (B)	Difference (A)-(B)	RISE 2018–19 High value-added schools (C)	Low value-added schools (D)	Difference (C)-(D)
Pupils						
Average pupil baseline score	559	475	84	504	460	34
Average pupil home assets index	0.86	−0.13	0.99	−0.36	−0.55	0.19
Age (years)	11.0	11.1	−0.1	11.3	11.1	0.2
% male	46%	51%	−5%	51%	53%	−2%
Teachers						
Age (years)	30.1	30.5	−0.4	32.2	29.8	2.4
Experience (years)	8.9	8.9	0.0	5.3	7.4	−2.1
% maths specialist	59%	27%	31%	89%	71%	18%
Content knowledge score	491	416	75	525	447	78
Schools						
% full-day	55%	9%	46%	33%	16%	17%
% urban	73%	30%	43%	57%	26%	31%

Source(s): Authors' computations using YL and RISE survey data

disadvantaged pupils accessed schools in rural areas, representing both an equity improvement and a challenge for teaching and learning. At the same time, the pattern is mixed – while average home asset levels declined between 2012 and 2018, access to pre-school improved and caregiver literacy improved in urban areas. In rural areas, 2018 marked a "turning point" in that the proportion of pupils in school who may be considered "first generation learners" began to fall. If this pattern represents a wider phenomenon outside of the sample, it may indicate that the challenges for schools and teachers related to educating pupils with illiterate parents may begin to lessen going forward, or conversely that the advantages of parental literacy will benefit a greater fraction of pupils. Both of these potential benefits, however, may take some years to feed into higher average learning outcomes. The disruption to education wrought by COVID-19 and thereafter by conflict and climate disasters has likely set back this process yet further.

Although growth in access in Ethiopia did not follow a one off "big bang" pattern more generally, the pattern in the most disadvantaged regions was more dramatic and more similar to that of countries such as Tanzania, where enrolments grew very fast in a short period. A "quantity-quality" trade-off may be difficult to avoid in such circumstances and gaps in average learning outcomes between regions, especially when compared to Addis Ababa where expansion was most limited, widened between 2012 and 2021. The gap in average mathematics scores between Addis Ababa and Somali rose from 63 to 95 points. Accordingly, the period is marked by improving equity of access but not of outcomes. In fact, in Addis Ababa, the most economically advantaged region, outcomes by 2021 had returned at least to the levels of 2012. Given that there was no significant surge in enrolments in this region, this finding may be taken to suggest that outcomes for equivalent pupils (in terms of advantage) over time have not necessarily declined. Alternatively, perhaps the GEQIP reforms, in the absence of surging enrolments, have played a role in counteracting the decline that might have

otherwise have occurred, for example, as a result of COVID. Unfortunately, the data necessary to determine the answer to this question are not available.

Outcomes are affected by changes in school populations but also by trends in school quality. Our analysis showed that on many observable dimensions, average school quality improved over the period 2012–2021. Also, some of the improvements, such as increases in teacher pedagogical content knowledge in rural areas, benefited more disadvantaged areas, representing equity gains. Our findings do not suggest another key measure of school quality in Ethiopian Grade 4 classrooms, that is "value-added" in mathematics, has deteriorated significantly nor that "learning progress" has fallen significantly between 2012 and 2018. This suggests that falling learning outcomes originate in lower progress in earlier grades or in "school readiness" at entry to Grade 1, despite widening access to pre-schooling, but consistent with more disadvantaged home backgrounds. Unfortunately, adequate data are not available to examine these issues. A third measure of school quality, per-pupil spending on primary education, has remained largely constant at very low levels in Ethiopia, under pressure from rising enrolments. Taken together, the evidence indicates that improvements in school quality indicators overall are modest.

While GEQIP has not raised learning outcomes in primary mathematics or even arrested their decline in some regions, the reform can be linked to a number of mechanisms which may be expected to raise learning outcomes in the longer term, depending on the influences of countervailing forces. Factors which are positively associated with learning progress in mathematics and with higher school "value-added" in mathematics are targeted by GEQIP and have been improved through GEQIP intervention. In particular, these include teacher knowledge/specialism/training and upgrading from shift to full-day schooling. Improvements in observable school and teacher quality indicators seem likely to have exerted opposing influences to those of increasing home background disadvantage among pupils in Grade 4, given that progress and value-added were maintained despite a more disadvantaged school population. The task for schools and teachers is challenging and perhaps increasingly so, however, in terms of "bridging the gap" between curricula and actual learning levels through pedagogical strategy.

While the GEQIP reforms appear to have played a role maintaining school quality in Ethiopia, this has not been at the expense of widening access as warned against by Chicoine (2019), but has rather been accompanied by falling learning outcomes. Nonetheless, this has likely enabled at least some of the wider social benefits of basic education to be extended to a large group of children in a relatively short period of time. Le Nestour *et al.*'s (2022) finding that the probability of attaining literacy with 5 years of schooling has declined steeply, however, sounds a note of caution. Investments in school quality improvements have likely been insufficient; and Ethiopian primary education faces serious resource shortages. Primary education in Ethiopia is financed to a very large extent and increasingly so from domestic sources. In 2020/21, 98.5% of planned education spending was expected to come from domestic sources with just 1.5% from external sources (UNICEF, 2022). The proportion of GDP per capita spent on primary education is lower than many countries in the region, while Ethiopia's spending at tertiary level proportionally high, suggesting scope for rebalancing.

Given ongoing improvements in access for more disadvantaged pupils in Ethiopia, it is especially important that schools and teachers are effective specifically for these pupils, who include those with lower levels of prior achievement and home support. Success in reaching these pupils not only in terms of access but learning is crucial in equity terms (see Crouch, Rolleston, & Gustafsson, 2021). Large disparities between regions make a case for future reforms to target more disadvantaged areas more directly. Asgedom *et al.* (2019) argue that the design processes of the GEQIP reforms in Ethiopia lacked regional and grassroots-level consultation, particularly with Regional Education Bureaus and Woreda Education Offices. This may have hindered effective implementation of the reforms in some regions.

In relation to our main research question, it seems likely that GEQIP has at least in part "cushioned" the impacts of enrolment growth on education quality in Ethiopia, but that

reforms have been insufficient to fully counteract these. There has been much improvement in access to education in Ethiopia and in important indicators such as literacy rates as well as in some key school and teacher quality indicators. In terms of recommendations, there remains scope to further prioritise primary education in budgetary terms (vis a vis higher education) and to target funds towards regions where access expansion has been most significant to arrest apparently devclining outcomes and widening inequalities. Improving access to quality pre-schooling may also serve to address issues of "school readiness", which may in part lie behind declining outcomes. The implementation of GEQIP and data available did not enable robust evaluation of these reforms and, while there are pressing reasons to roll-out such reforms quickly and universally, there is arguably a need for better data suited for evaluation and analysis of the Ethiopian education system, with a view to improving quality, equity and efficiency and in support of future reforms.

Notes

1. Formally the Provisional Military Administrative Council (PMAC) which ruled Ethiopia 1974–1987.
2. GDP in constant 2015 USD was $263.1 in 1997 and $630.3 in 2015 (World Bank, 2024).
3. See https://www.younglives.org.uk/
4. See https://riseprogramme.org/countries/ethiopia

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Table A1. Key pupil background indicators for the 2012–13, 2018–19 & 2020–21, 33 common schools cohorts, by rural-urban location

Indicator	2012–13 Overall (n = 1717)	R (n = 587)	U (n = 1,130)	Diff.	2018–19 Overall (n = 487)	R (n = 252)	U (n = 235)	Diff.	2020–21 Overall (n = 579)	R (n = 309)	U (n = 270)	Diff.
Average student age	11.24	11.33	11.18	−0.15*	11.31	11.66	10.94	−0.72***	11.31	11.56	11.03	−0.53***
Proportion of students who attended preschool, %	47.0	27.0	57.0	28.0***	45.0	28.0	63.0	35.0***	56.0	43.0	71.0	28.0***
Average number of absent days in the current school year	1.74	2.73	1.21	−1.52***	1.58	2.38	0.70	−1.68***	4.06	5.53	2.38	−3.15***
Household durable assets, average	0.41	−0.52	0.91	1.42***	−0.29	−0.85	0.32	1.17***	−0.11	−0.62	0.47	1.1***
Primary caregivers' literacy, %	49.0	45.0	52.0	0.07**	45.0	32.0	58.0	25.0***	56.0	43.0	70.0	27.0***

Note(s): R=Rural, U= Urban, Diff. = Difference in mean scores between Urban and Rural; t-test of the differences is significant at $^{***}p < 0.001$; $^{**}p < 0.05$; Households' durable assets were used to measure household economic status, which serves as a proxy measure for overall household economic advantage. We decided to exclude items related to access to electricity, access to tap water, and other services because they do not apply to rural areas of Ethiopia

Source(s): Authors' computations using YL and RISE survey data

Table A2. Learning levels and learning progress for the 2012–13, 2018–19, and 2020–21 cohorts, by region, locality, and socio-economic backgrounds: for the 33 common schools

		2012–13				2018–19				2020–21			
		N	BL Mean (SD)	EL Mean (SD)	Prog	N	BL Mean (SD)	EL Mean (SD)	Prog	N	BL Mean (SD)	EL Mean (SD)	Prog[a]
Total		1,743	510 (84)	545 (94)	*30*	487	467 (92)	504 (103)	*37*	579	466 (86)	471 (106)	*5*
Region	Addis Ababa	220	536	580	*44*	79	526	568	*42*	83	535	565	*30*
	Amhara	427	514	548	*34*	116	491	517	*26*	149	486	496	*10*
	Oromia	409	497	541	*44*	122	434	495	*61*	167	445	430	*−15*
	SNNP	550	515	542	*27*	121	457	478	*21*	166	436	441	*5*
	Somali	137	473	501	*28*	49	428	457	*29*	14	438	470	*32*

Note(s): BL: Baseline; EL: Endline; Prog.: Progress in mean score over a school year

[a]The 2020–21 survey covered a shorter period than those in 2012–13 and 2020–21 and was affected by the COVID pandemic which explains at least part of the much lower progress observed

Source(s): Authors' computations using YL and RISE survey data