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Eliminating Global Learning Poverty: The Importance of Equalities and Equity

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Abstract

This paper explores the quantitative relationships between average levels of learning achievement across countries, changes in average levels of learning achievement, the inequality of distribution of achievement (akin to income or wealth inequality in general development analysis), and the proportion of students learning at or below an absolute minimum (akin to poverty in general development analysis). The paper uses a variety of data from cross-national and national assessments: aggregate data, micro (student-level) data, school-level data, and time-series data. The paper shows how various factors such as gender or wealth impact learning levels, but also shows that 'systems-related' inequality, not directly related to such factors, is typically much larger than inequality associated with any of those factors. The paper shows that countries progress from very low average levels of achievement to middle levels more by reducing the percentage of students with very low scores (that is, by paying attention to the 'bulging' left-hand tail of the distribution) than by increasing the percentage of high performing students. The availability of micro data from a particular case allows exploration of the relationship between inequality measures and measures of the percentage of students below a low level of achievement and shows that, at least in that case, the reduction in inequality that accompanies improvements in the average levels takes place mostly through a reduction in the percentage below a low level. Unlike in the case of income, where vast reductions in income poverty seem possible without reducing income inequality, the evidence presented here suggests that this typically does not happen with learning levels: inequality reduction, reductions in percentages below a low level, and improvements in the averages are all empirically connected. More work is needed to show whether that connection is also causal.

Eliminating Global Learning Poverty: The Importance of Equalities and Equity

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1. Introduction

Learning levels among the vast majority of children in developing countries often do not meet the expectations of national curricula, nor even the much more basic levels of competence tested in “citizen-led” assessments (e.g., ASER, UWEZO). Moreover, the median level of achievement in many developing countries equates to approximately the 5th percentile of the distribution in OECD countries; a level at which OECD pupils might be expected to receive remedial intervention. The scale of this ‘learning crisis’ has been well documented (Pritchett & Viarengo 2009a, Sandefur 2016, World Bank 2018, World Bank 2019, UNESCO 2017). In 2017, UNESCO estimated that 617 million children around the world are not learning even at basic levels, while, most recently, the World Bank (2019) has estimated that about half of children in low and lower-middle income countries cannot read a simple paragraph at age 10.

De facto exclusion of most children from minimum acceptable learning competencies represents not only a major failure of education systems, but also an ‘equity crisis’ on a global scale. Poor learning among most children, especially where it is a result of poor-quality education, is inequitable not only because it contributes to massive global (North-South) inequality, but also because the failure to develop and realize the talents of all pupils, is in itself unjust. This latter form of inequity is not so much a distributive concern per se but is linked to absolute notions of rights, entitlements or opportunities to develop valuable human ‘capabilities’ and ‘functioning’, in whose pursuit education plays a key role (Sen 1985; 1989).

Broadly in parallel with income inequality, around half of global inequality in learning outcomes lies within countries while inequality within developing countries is often much greater than inequality within OECD countries and is larger than income inequalities in some cases. At the same time, average performance levels are typically very low and the percentage of children performing very poorly as measured by criterion-referenced benchmarks is as high as 50% (World Bank 2018). South Africa and India provide particularly striking examples.[1] While much attention has been paid recently to low learning outcomes in the developing world and to inequality between developing and OECD countries, less attention has been given to the role of ‘total inequality’; that is inequality within as well as between countries and country groups in explaining the scale of ‘learning poverty’, understood as the prevalence of low learning outcomes. Interest in inequality measurements in education date at least to Thomas, Wang, and Fan (2001) who apply the concept to years of educational attainment but not to learning. The World Bank has a long tradition of carrying out “benefit incidence” analysis whereby, under certain assumptions, the shares of education spending going to different deciles of the income distribution are calculated. These methodologies have been elaborated fully in manuals (see Demery 2000 for instance). More recently, researchers have begun to apply concepts such as the Gini coefficient to learning data, usually using just one assessment at one point in time (see Freeman, Machin, and Viarengo 2011; Oppedisano and Turani 2015; Micklewright and Schnepf 2006; and Bruckauf and Chzhen 2016; Sahn and Younger 2007).

The nature of the systemic failures that explain the prevalence of poor learning outcomes, and their inequality, is a key area of contemporary study and debate, not least at the programme

[1] In TIMSS 2003, India (selected states) and South Africa were among the lowest performing entities (with South Africa being the lowest of all) as far as average test scores are concerned. Dispersion as measured by the difference between 5th and 95th percentiles of the test score distribution was highest among all participating countries in South Africa and second highest in India – in both cases the 5-95 percentile spread is greater than 300 points—in an assessment where the global mean is set to 500. See Das and Zajonc (2008)

which published the two papers this paper is based on.[2] This paper, however, is primarily concerned with equity and inequality in learning outcomes as such rather than with systems analysis of how to improve low learning levels, while this is given some consideration in discussion of policy implications. Countries with low average learning levels and high inequality face considerable challenges in raising learning outcomes which typically follow a positively skewed distribution characterized by a large left-hand 'bulge[3]' (rather than a 'tail') of poor-performing children, often in poor-preforming schools. The question of how much improvement in learning outcomes in a country, overall, could be achieved by reducing or eliminating inequalities is largely an empirical one, linked to the nature of the distribution of learning outcomes and to which inequalities one is concerned with. Focusing on raising attainment among poor-performers specifically (defined by some minimum proficiency level as indicated by SDG 4.1), however, may serve the joint equity goals of reducing unfair inequality in outcomes (linked to poor quality schooling for example) and reducing the prevalence of absolutely low levels of learning or 'learning poverty' as well as delivering increases in average attainment.

We examine the extent to which this equitable or inclusive route to improved outcomes is consistent with available data for relevant countries which have shown improvements in learning outcomes. We draw substantially on two papers here are part of this effort (Crouch and Rolleston 2017, Crouch and Gustafsson 2018) to analyse the drivers of inequality as well as to understand these in an equity framework. The aim of the paper is to explore the contributions of various forms of inequality to the global problem of low learning outcomes; to consider the equity implications of both inequalities in and the prevalence of inadequate learning levels; and to examine these issues in relation to two distinct types of inequality – those linked to individual or household characteristics and those we term 'system-related inequalities'.

The rest of the paper proceeds as follows. Section 2 discusses the conceptualization and measurement of equity and inequality for the purposes of our analysis. Section 3 employs aggregated cross-national data to characterize some of the 'sources' or 'proximate determinants' of inequality in learning outcomes. Section 4 employs data from a comparative longitudinal study to examine the axes of inequality within and between countries, primarily India and Vietnam, including a consideration of the relationship between inequality in learning outcomes and differences in school quality or effectiveness. Section 5 discusses the extent to which improvements in average learning levels in the past few decades are most strongly associated with reductions in inequality of learning outcomes or in reductions in the proportion of children falling below a benchmark of minimum proficiency. Section 6 briefly presents tentative evidence from large-scale programmatic interventions on the relationship between increases in learning outcomes resulting from successful interventions and reductions in inequality in learning outcomes in the same samples i.e. programme 'treatment' groups. Section 7 discusses potential policy implications of the study, concludes and provides some indications for further work.

It may be useful to note that the paper is to a significant degree an exercise in pattern-seeing. Since these patterns are becoming clear only with the relatively recent increases in

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[2] RISE: Research on Improving Systems of Education. The two relevant papers are Crouch and Rolleston (2017) and Crouch and Gustafsson (2018). See: http://www.riseprogramme.org. Both Crouch and Rolleston are formally associated with RISE.

[3] See section 5 of this paper for a graphical representation of a characteristic 'bulging tail' distribution of learning outcomes.

assessment, a logical first step is to note the patterns. Exploring the causes behind the patterns calls for further and different research. That research is likely to have to be of two types: systems research and some experimental research. The patterns we note are systemic, one-off, and historical, and are by their very nature impossible to experiment with. However, data from experiments can be analyzed to try to understand what might be underpinning the once-off historical changes in the systems. Some causal hints are provided in Section 6, based on data from an experiment or at least an experiment-based scale-up.

2. How should we understand and measure equity and inequality in global education?

Equity and equality in education are notions which are expressed and understood in numerous ways in the literature. However, examining the magnitude of inequalities in learning outcomes, such as the size of achievement gaps between genders or between OECD and low-income countries, is largely an empirical and quantitative endeavor. By contrast, assessments of equity are necessarily normative, requiring value judgements about what constitutes 'fairness'. It is in this normative element, that we understand the key distinction between equality and equity to lie. Inequalities can be defined and measured in a variety of ways, some of which are employed in the sections that follow. We understand 'equity' as 'justice' of 'fairness'. These are fundamentally matters of qualitative judgement based on values. There may be equitable inequalities – for example the use of inequalities in funding to alleviate poverty (redistribution). There may also be inequitable equalities – for example the allocation of equal funding regardless of need.

Equity and equality are closely linked, however, in that educational equity is often considered to be a situation without 'unfair' inequalities. Notions of 'fairness' are, nonetheless, contested and judgements about what is equitable in terms of educational opportunities and outcomes are political, ethical and cultural in nature. Rawls' (1971) seminal 'Theory of Justice' provides a powerful argument for 'justice as fairness', comprising of two basic principles: equal basic liberties, and fair equality of opportunity. For Rawls, inequalities of outcome are justifiable only to the extent that there is equality of opportunity[4]. Put simply, ensuring fairness of outcomes in education may be understood on this view to require comprehensive 'levelling of the playing field' with respect to opportunities to learn, including school quality and resources and broader support for learning at home or in the community. However, a spectrum of conceptions of the notion of equity can be found in the education literature, linked largely to interpretations of liberty and equality of opportunity. While it is perfectly possible, as Kolakowski has noted, to conceive of a society where there is simultaneously too little equality and too little freedom - 'we can suffer numerous evils simultaneously and comprehensively' (Kolakowski 1997), a society where there is, simultaneously, a limitless amount of both is not readily conceivable; since some curtailments in freedom may be needed to provide for equality of opportunity. How one balances liberty and equality, is a matter of justice, which, Adler (1981) argues, is 'sovereign' over liberty and equality. More libertarian conceptions of equity favour more individual liberty at the expense of equality, for example focusing on 'equal access to basic educational services'; while more egalitarian conceptions favour curtailing more liberty to

[4] Rawls' (1971) provides a seminal thought experiment in which decisions concerning the organisation of society are made from an 'original position' behind a 'veil of ignorance' regarding individuals' own starting points in terms of advantage such as creed, wealth, gender, ethnicity, and so on. He contends that a 'social contract' established from this position would embody a 'principle of difference' according to which inequalities are justified only to the extent that they benefit the least advantaged. That is to say, only where without such inequalities, the worst-off would be made even worse-off.

ensure greater 'equality of outcomes', for example by employing strong redistributive policies.

UIS et al (2018) examine five definitions or perhaps dimensions of equity in education – those based on meritocracy, minimum standards, impartiality, equality of condition and redistribution. While they overlap somewhat, they serve to highlight key differences of approach concerning the trade-off between liberty and equality. The notion of impartiality (of an education system) is closely related to 'equality of opportunity' and goes beyond equality merely in respect of minimum set of standards or criteria to a broader conception of equal educational opportunities across groups of more and less advantaged children. 'Equality of condition' rather denotes a level of equality in relation to a key educational variable – for example 'years of schooling' and emphasises 'equal distribution' or minimal variance. 'Redistribution' emphasises the extent to which education redistributes opportunity and resources and redresses unfair inequality of inputs and outcomes, including by providing more resources to those in greater need, where required. 'Meritocracy' emphasises that educational progress should be related to 'ability', rather than, for example, socio-economic characteristics, raising some difficulties linked to the conceptualisation and measurement of 'ability' but nonetheless highlighting the need to remove the influence of 'unfair advantage'. Impartiality, redistribution and meritocracy aim towards a similar 'ideal' distribution of outcomes, with different emphases – one in which inequalities in outcomes are not the result of unfair inequalities elsewhere. Achieving 'minimum standards', depending on how high these are set, may require much more limited redistribution but can nonetheless, if standards are set high, have strong redistributive implications.

Important international policy documents draw variously on these notions of equity and their links to inequalities. For example, the education SDG[5] on learning in basic education enjoins the world to 'ensure that all girls and boys complete free, equitable and quality primary and secondary education', suggesting equality of condition. Its associated indicator, however, tracks the 'percentage of children/young people…achieving at least a minimum proficiency level', suggesting a minimum standards approach. These proficiency levels are being developed and, as suggested above, their implications in equity terms will partly depend on how high levels are, within the bounds of feasibility. This indicator also calls for 'disaggregations: sex, location, wealth (and others where data are available)', pointing towards an 'impartiality' conception alongside minimum standards. Goal 4.5, aimed explicitly at equality, states that countries are to 'eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.' The associated indicator tracks 'parity indices' including those for female/male, rural/urban, bottom/top wealth quintile and others such as disability status for all other relevant SDG education indicators, where this is possible. The focus on parity here may suggest various conceptions of equity, depending on the indicator. Parity by gender, for example, requires impartiality and, in some contexts, redistribution. 'Equal access' may suggest 'equality of condition'.

While the SDGs and associated indicators draw on various notions of equity, it is clear that inequalities associated with axes of potential disadvantage such as gender or socio-economic background are foregrounded and addressed directly; and that their elimination is required for equity, understood as impartiality. There are, however, a great many 'sources' of inequality in learning outcomes, both within and between countries, which are not characteristics which belong directly to children, their families or areas of residence. For example, inequalities that

[5] Technical, detailed, and official documentation at https://undocs.org/E/CN.3/2016/2/Rev.1.

are the result of school and teacher quality, pedagogy, curricula, school management and accountability and so on. To the extent that these are correlated with, say, socio-economic status, SDG indicators would be expected to pick them up indirectly. But they are not always strongly correlated and may need direct attention for equity to be realized in any case. Inequalities in outcomes due to differences in quality of schooling are arguably no less unjust than those related to children's backgrounds but may be less readily detected in the available data (and less obvious to citizens themselves and to civil society) or less easily converted to an indicator whether for statistical or political reasons.

The high performance of Vietnam in PISA, for example, is indicative of a highly effective education system in a resource constrained context. Within any particular country, attention to equity solely in terms of impartiality and also equality of condition and even meritocracy and redistribution may serve to ensure that 'gaps' in learning outcomes on the basis of known axes of disadvantage and discrimination are minimized. It remains possible, however, that the resulting distribution of outcomes as a whole remains inequitable; because learning levels are 'too low' overall. Here, the 'minimum standards' or 'minimum proficiencies' notion of equity can provide a powerful counterweight, when standards are set appropriately. This conception focuses not on gaps but on standards overall, ideally being linked to meaningful and criterion- rather than norm-referenced stages of educational progression. In the World Bank's approach for example, standards such as 'a minimum level of reading proficiency by age 10' are established while it is noted that 'policies to improve learning among lower-performing schools and pupils (the tail of the distribution) are required to improve learning equitably and to reduce unfair inequality' while noting strongly this is not to neglect overall quality (see World Bank 2019).

This approach draws attention to what we are calling 'systems-related inequality.' This is in contradistinction to the usual sorts of attribute-related inequalities discussed by the global education community, such as gender-related or wealth-related inequality. This is an attempt to draw attention to a relationship between educational standards systems, focusing on inequalities which result from avoidable, and hence unfair, variations in schooling quality. Clearly, it may not be possible or desirable to eliminate all inequality, that linked to effort for example, but only 'unfair' inequality. 'Gap metrics' provide useful indicators of particular axes of unfair inequality while systems-related inequality metrics provide summary measures of all inequality, regardless of the source or 'fairness' involved. Gini coefficients are used frequently by economists to provide measures of dispersion or inequality in income, consumption and other important living standards indicators. Thomas, Wang, and Fan (2001, 2003) have applied Gini coefficient measures to educational attainment with resulting estimates ranging from around 0.2 to around 0.6, depending on the country. However, the attainment metric employed was years of completed education, not a specific learning outcome. Owing to the various scaling of test-scores from different kinds of assessments, Gini metrics in education require careful interpretation. Recently, however, there have been numerous attempts to measure and document this kind of inequality in learning outcomes, and particularly to link inequality (or equality) to average outcomes including by Freeman, Machin, and Viarengo (2011), Ferreira and Giroux (2011), Oppedisano and Turani (2015), Micklewright and Schnepf (2006), Bruckauf and Chzhen (2016), Sahn and Younger (2007). Wagner, one of the early and strong advocates of 'smaller, quicker, cheaper' learning assessments (such as EGRA and ASER) (see Wagner 2003, 2011, 2013), has advocated for the use of Gini coefficients of learning outcomes (see Wagner 2017 and Wagner et al. 2018), as a way to supplement, and even as an alternative, to the attempt to create globally comparable measures of learning. He argues that if the Gini coefficient can be taken as 'unit-less' measure of inequality, then it may serve as a useful comparative metric for examining inequality across contexts, avoiding at least some of the difficulties of comparing directly using assessments which require scaling. To the extent that reducing inequality is most readily achieved by eliminating low performance, the effect may be to focus attention on the 'bottom of the pyramid' in terms of learning outcomes.

In the rest of this paper we use various assessments (for different grade levels), different subject matters, and even types of assessments, in different continents, to show the patterns that emerge. However, due to lack of space, we do not show all possible combinations. That is done in Crouch and Rolleston (2017) and Crouch and Gustafsson (2018).

3. Sources of Inequality: Some aggregate evidence

Not all international assessments collect data on or report comprehensively on the axes of inequality that characterize the distribution of learning outcome measurements. However, one that does is SACMEQ II, a Grade 6 assessment in reading and mathematics applied mostly in Southern and Eastern Africa. Available data provide information on differences in learning outcomes between children who are rich or poor, differences between regions, urban and rural areas, boys and girls and the differences between higher and lower performing groups in the overall distribution of outcomes. These axes may be considered 'sources of inequality' for simplicity but it is important not to confuse sources with 'causes', strictly understood, since clearly there is much overlap between groups and many children in a particular disadvantaged group will suffer multiple forms of disadvantage.

Figure 1 presents the 'sources' of inequality, by type, in mathematics and for reading, making use of data from SACMEQ III. It shows the simple average differences for each source for all participating countries taken together (fourteen in total).[6] The largest difference is the difference in score between children scoring at the 75th percentile and those scoring at the 25th in the assessment[7], a measure of 'systems-related inequality' (recall definition in Section 1) , representing a difference of more than one standard deviation in both subjects. This type of inequality is linked to factors such as socio-economic inequality but is also the result of variation in school quality, standards and 'quality control' in the form of management and accountability as well as the content of the assessment. The difference between learning outcomes of rich and poor children, comparing the 75th (poor) and 25th (rich) percentiles on the SACMEQ socioeconomic status index provides the second largest inequality, while differences between the highest-scoring and lowest-scoring geographical regions, are also important. The difference between boys' and girls' learning outcomes is real but not very large at all, and in one case favours boys, in the other case favours girls. The difference between rural and urban areas, at around 0.25 standard deviations in mathematics (more in reading) reaches a level which, in the case of an educational impact evaluation would be considered of notable importance. It is interesting that the differences are typically larger for reading than for mathematics.

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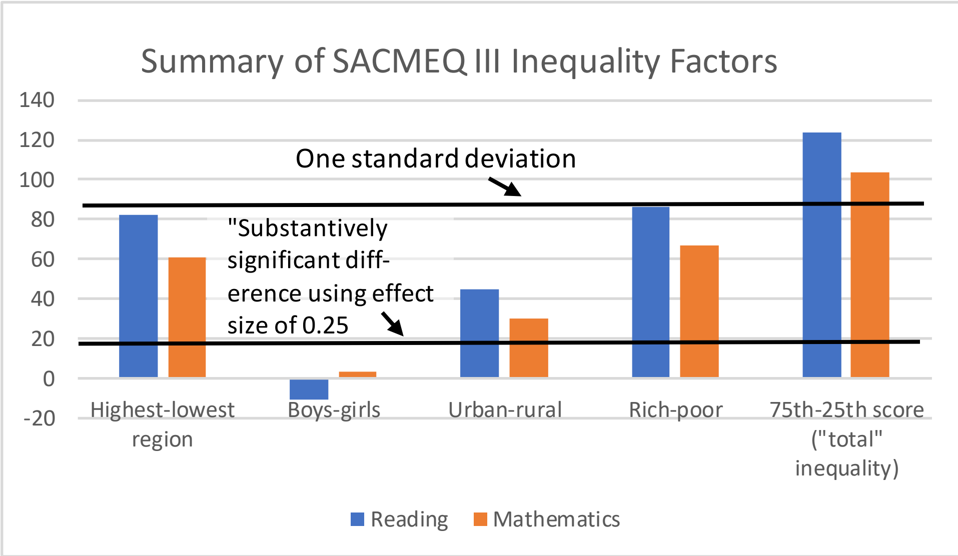
[6] The data emphasize absolute differences. These may loom larger or smaller depending on the scale of the assessment. But the main point here is not to analyze the size of the differences per se, but how their sizes depend on each source of difference.

[7] Whenever we assess 'strength' or 'size' in this paper, we will typically reason in terms of proportions of a standard deviation. It is now somewhat conventional, also, in using these international assessments, to note (as detailed in PISA's comprehensive reports) that somewhere around one third to one half of a standard deviation is equivalent to one grade's worth of difference in learning achievement. Thus, a difference of one standard deviation is a large difference: at least one, two, or possibly three grades' worth of studies. See OECD (2016).

Figure 1. Factors in SACMEQ III inequality



Source: Crouch and Rolleston (2017), p. 4.

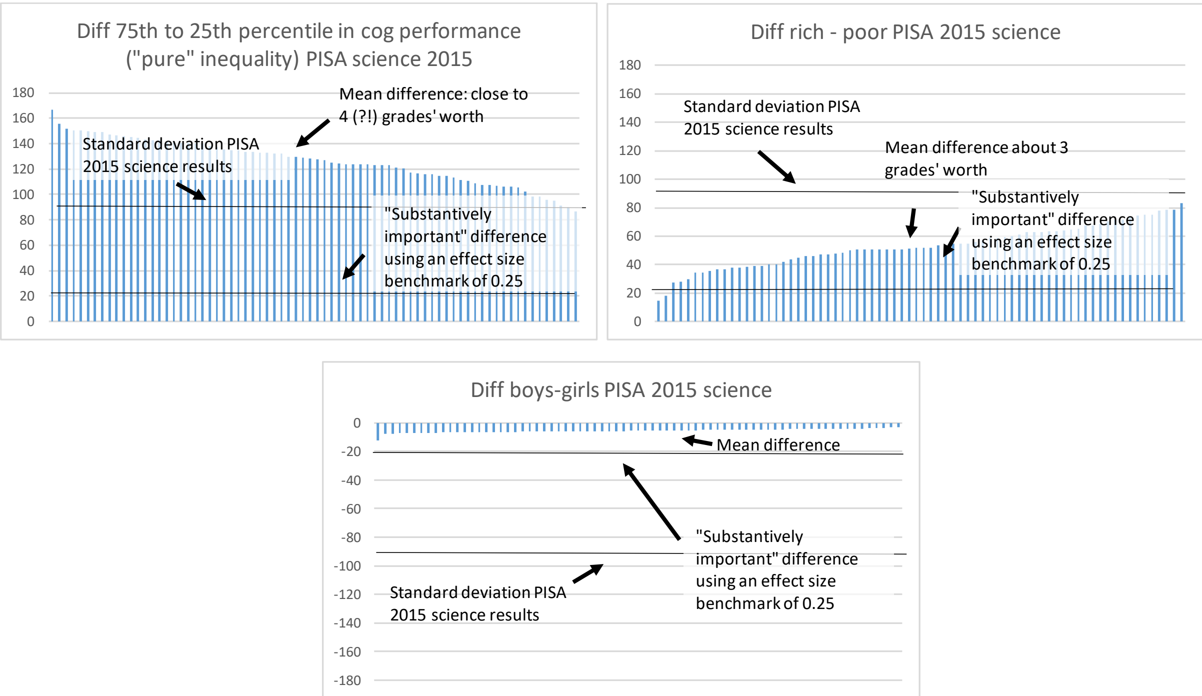
The 2015 application of PISA, an assessment that is applied mostly in OECD countries, but increasingly in developing countries, also contains the possibility of some interesting contrasts in terms of 'systems-related' inequality, gender inequality, and inequality associated with being 'rich' or 'poor.' In this case, unlike the SACMEQ case, we can show all participating countries, so that the full pattern of variation between countries can be appreciated. We take the science scores in PISA, to use a metric different from reading and mathematics.[8] The results in Figure 2 are all reported on the common PISA scale, so that the relative size of the differences can be compared directly. Each bar represents a particular score difference in a single participating country. Each graph shows as a horizontal line the standard deviation of the PISA science assessment (about 90 scaled points), and a notional 'effect size' of one quarter of one standard deviation (25 scaled points) for comparison purposes. In common with the results on Figure 1 for SACMEQ, by far the largest source of inequality in learning outcomes on PISA is systems-related inequality. In fact, systems-related inequality is equivalent to as much as three to four grades' worth of learning progress. As previously, systems-related inequality is a function of a variety of other axes of inequality, including school quality and subsumes the gaps linked to other sources. On PISA, the rich-poor axis of inequality varies notably by country but is typically quite large - measured at around half of one standard deviation. The gender gap is typically relatively small and in science favours girls. Note that while the SACMEQ results use reading and mathematics and the PISA results use science, the results hold largely no matter what assessment and what subject-matter is used, with some minor exceptions. The similarity in the results of the SACMEQ and PISA analyses found in a number of other assessments, is reported fully in Crouch and Rolleston (2017) and Crouch and Gustafsson (2018).

In summary, both SACMEQ (focused on a particular set of developing countries) and PISA Science (mostly high-income countries) show the importance of "systems-related" inequality as different from inequality associated with particular factors such as gender or wealth. The

[8] It will be noted that we use a variety of subjects and assessments to illustrate the key points, and that those points hold across subjects and assessments, but we do not use all subjects in all assessments. That would require a much longer paper. The examples are not cherry-picked, however. That the patterns hold over almost all pairings of assessments and subject matters is shown in Crouch and Rolleston (2017) and Crouch and Gustafsson (2018).

differences between countries are notable. Sometimes they make intuitive sense, sometimes less so. Two countries on the extreme left of the top left panel are Israel and France, for instance. Countries where one would expect more equal results such as Hong Kong or Vietnam are the other extreme of the same graphic, almost all the way to the right. Science is used here just for variety. Other assessments documented in Crouch and Rolleston (2017) and Crouch and Gustafsson (2018) show a similar pattern.

Figure 2. PISA Science 2015 inequalities within and between countries



Source: Crouch and Rolleston (2017), p.5.

4. Sources of inequality: longitudinal and micro data in India and Vietnam

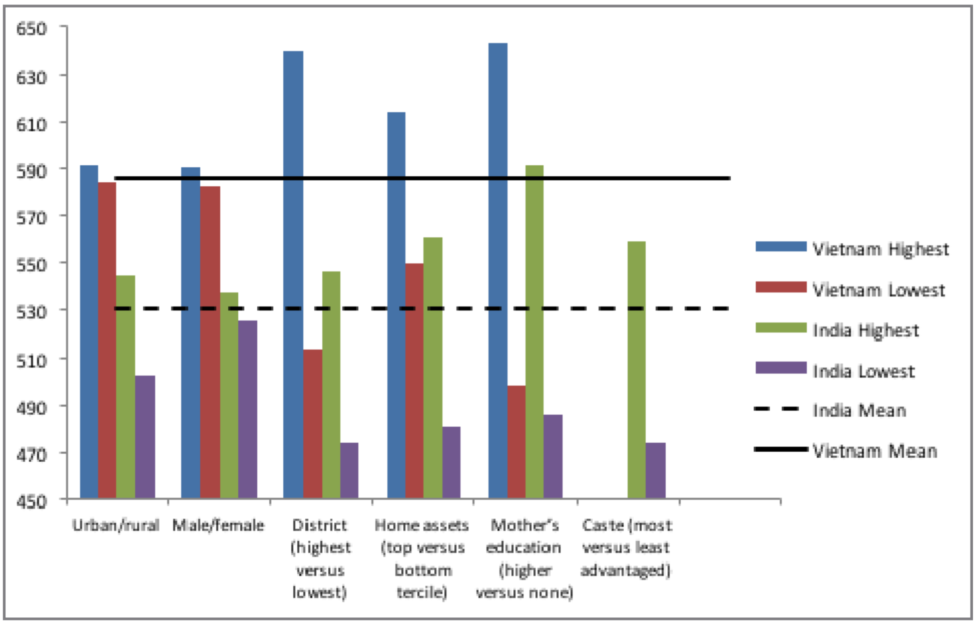
Test score data from Young Lives[9] secondary school surveys for pupils aged 14-15 conducted in 2016-17 allow an indicative comparison of between and within-country inequalities. In Figure 3, scores in mathematics[10] are compared between lower and higher performing groups within two countries with similar GDP per capita[11] – India (the states of Andhra Pradesh and Telangana) and Vietnam. Learning outcomes are generally higher in Vietnam and inequalities smaller. For illustrative purposes, we consider which inequalities in India, if eliminated by raising outcomes to the level of the higher group in the relevant pair, would raise learning levels closest to those in Vietnam. It is apparent that raising girls' learning outcomes to the average for boys in India could be expected to reduce the performance gap between India and Vietnam by around 20 percent. Raising rural pupils' attainment to the level of urban pupils

[9] An international study of childhood poverty. See www.younglives.org.uk. The Young Lives study is a four-country comparative longitudinal study (Ethiopia, India, Peru, Vietnam) begun in 2001 collecting data at the households of 12,000 index children in two cohorts, born in 2001/2 and 1994/5. School surveys linked to the household samples have been conducted since 2010. A full discussion of the household and school surveys is available in Boyden and James (2014).
[10] Equated on a common interval scale (mean 500, standard deviation 100) using scaling procedures similar to PISA
[11] The state of Andhra Pradesh had a GDP pc of $2419 in 2017, ranking 16th of 33 states in India and Telangana had a GDP pc of $3035 ranking11th (see http://statisticstimes.com/economy/gdp-capita-of-indian-states.php) The GDP pc of Vietnam in 2017 was $2365.

in India would reduce the gap by around 50 percent, while performance among pupils in rural Vietnam would remain very substantially ahead of urban pupils in India, given the small urban-rural gap in Vietnam. Raising all attainment to the level of the highest performing district in the India sample would have a similar effect, still falling considerably short of the Vietnam mean. Raising attainment to the level of the wealthiest tercile of pupils or to the most advantaged social group (general caste) would close the gap a little further. But only by raising all achievement in the Indian sample to the level of pupils whose mothers had received university education, would attainment reach the average levels of Vietnam. Clearly, children with university-educated mothers in are a comparatively rare and much advantaged group (including in terms of other indicators used here such as household wealth) and this observation offers little in terms of policy solutions.

The broader implication is that for the most part, inequalities due to factors such as gender, wealth, and location, are only a partial explanation for low learning levels, when comparing across countries. Closing some large and important attainment gaps in India (such as by location or wealth) may be expected to reduce the gap with Vietnam by only around half, leaving an equal amount of difference in attainment unexplained between these two countries and education systems, using this indicative comparison. Singh (2014) examines the issue in terms of the 'productivity' of the two systems at various stages. He shows that, especially in early stages of education, the Vietnamese system delivers greater 'learning gains', adjusting as far as is possible for differences in backgrounds and home endowments. This points to 'system-related inequalities' in earlier stages of education as an important part of the explanation in learning outcome gaps between the two countries by age 15.

Figure 3: Learning performance in mathematics at age 14-15 (India and Vietnam)



Source: Young Lives

Figure 3 shows the higher attainment of more advantaged pupils in both Vietnam and India is in part a function of individual child factors plus home advantage. School systems and school quality also play a major role. Rolleston and James (2015) and Rolleston (2016) discuss differences between the two countries' systems, including the notable differences in per capita expenditure, teacher qualifications and experience and access to resources such as learning materials. Policies may be designed specifically to mitigate the effects of background and school-level disadvantage and a number of such initiatives have been implemented in Vietnam, including 'fundamental school quality indicators'(FSQL), part of the broader 'Primary Education for Disadvantaged Children' (PEDC) projects (see Rolleston and Krutikova 2014).

Moreover, the pattern of school supply in many contexts is such that less advantaged pupils attend poorer quality schools, either in terms simply of resources or in terms of effectiveness, that is, 'value-added' to pupils' learning outcomes (see Rolleston and Moore (2018) on India). In addition, children from disadvantaged backgrounds may also benefit less from the quality of schooling if the impact of school quality is heterogeneous. When compared to their more advantaged peers in the same schools, disadvantaged pupils may in some contexts make less progress as a result of an improvement in school quality, other things being equal. Glewwe et al (2017) examine this issue using Young Lives data in a comparison of Peru and Vietnam. While they find no apparent evidence of differential school effectiveness by pupil advantage (measured in a number of ways) in Vietnam, they do find this for Peru on some measures of advantage. Schools in Peru are found to be more effective for advantaged students defined by prior performance or by native language, other things being equal.

In any particular contexts, this combination of effects may potentially lead to a 'triple disadvantage' in the form of (i) disadvantaged home background (ii) 'selection' into a lower quality schools, and (iii) benefitting less within a school than more advantaged pupils. The last among these, i.e. differential school effectiveness for different groups of pupils within schools may be the result of discrimination, including linked to institutional features of the system. For example, children from 'lower caste' backgrounds in India or children whose first language is not the language of instruction in school, may be systematically disadvantaged by the curriculum and/or by teachers' beliefs and behaviours (see for example Rawal and Kingdon 2010 on India)

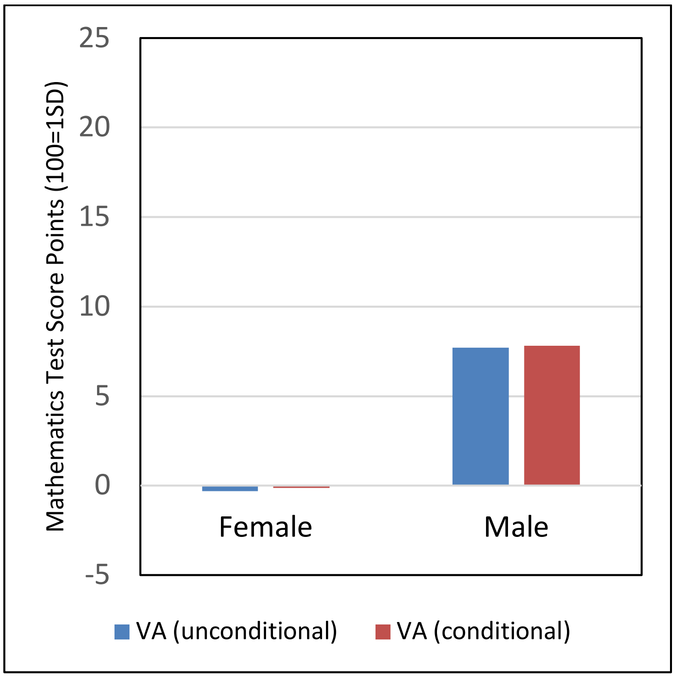
Using Young Lives data from the India secondary school (Grade 9) survey only, Figures 4 to 6[12] illustrate the relationship between home disadvantage and school effectiveness measured by value-added[13] in mathematics. The bars in Figures 4 and 5 show school value-added estimates both with and without conditioning on pupils' backgrounds averaged at the pupil-level, grouped by gender (Figure 4) and category of mothers' education (Figure 5)[14]. These figures illustrate the average effectiveness of schools attended by pupils with different characteristics. School-level value-added is centered on zero so that an estimate of zero represents the mean school in terms of value-added. Figure 4 shows that on average boys are sent to more effective schools than girls, while the difference is rather small, at around 0.05 standard deviations.

Figure 5 shows that, for example, pupils whose mothers have received higher education

[12] These three figures are reproduced from Rolleston and Moore (2018) where a full consideration of a range of school effectiveness 'gaps' is provided.
[13] Value-added measures attempt to identify the relative contribution of schools to progress made by pupils over a particular period of time as measured by two or more tests over a specified period. The approach used here employs a simple two-level multi-level model with random-effects at school-level, first an 'unconditional' value-added model with attainment in mathematics at the end of Grade 9 as the dependent variable and including prior attainment (at the beginning of Grade 9) as the only explanatory variable; and second a 'conditional' model which includes student background variables - age, gender, household wealth, parental education, parental literacy, caste and orphan status. Value-added estimates are school-level random-effects (intercept) estimates. See Rolleston and Moore (2018) for a full discussion.
[14] One hundred points represents one standard deviation on the mathematics test score scale (roughly equivalent to around three years' average schooling).

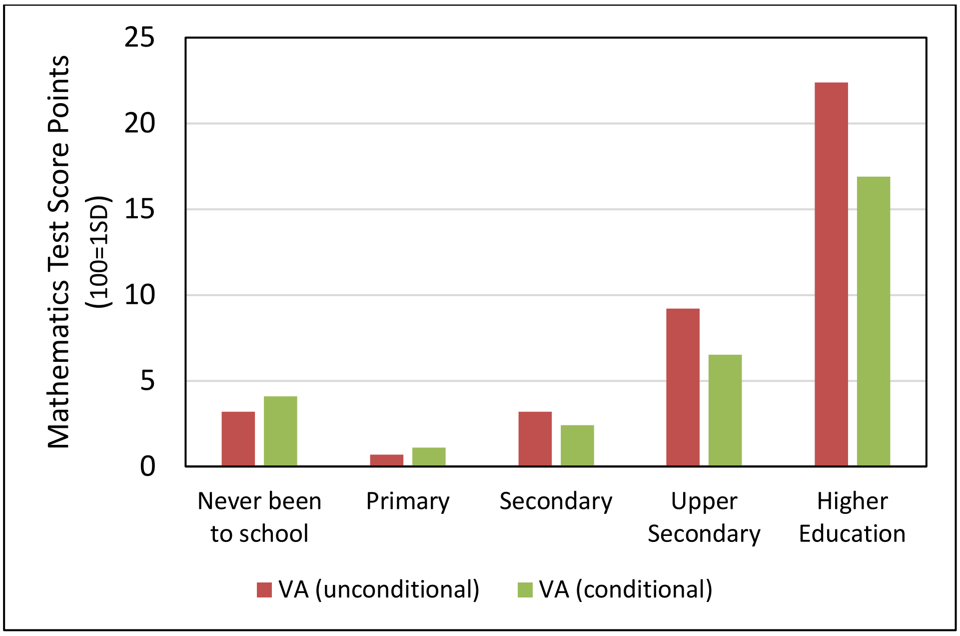
attend schools which improve pupils' test scores by up to 0.2 standard deviations more than those whose mothers haven't been to school. In the case of mothers' education particularly, inequality between pupils' attainment is being driven substantially by differences in school quality (as well as the individual effects of having more educated mothers), compounding the effects of home advantage. While the advantage of a more educated home background clearly exerts both direct and indirect effects on pupils' learning, the fact that pupils with more educated backgrounds are able to access higher quality schools – likely via a number of routes including ability to pay for private schooling, location of residence and information about school-choice, may be considered an important dimension of system-induced inequality. Heterogeneity of school quality and indeed a prevalence of schools of relatively low-quality are features of education in many parts of India.

Figure 4: Access to School Quality (India): Mean School Value-Added by Pupil Gender



Source: Young Lives Secondary School Survey 2016-17 India (AP and Telangana)

Figure 5: Access to School Quality (India): Mean School Value-Added by Pupil's Mother's Education Level.



Source: Young Lives Secondary School Survey 2016-17 India (AP and Telangana)

School type and who accesses which type of school contributes to inequality, where school-type is closely linked with quality and effectiveness. Figure 6 illustrates the more general relationship between pupils' home advantage and the learning outcomes of the schools they attend, according to four key school types in India. This time results are shown for English, a subject particularly associated with economic advantage both in terms of backgrounds but also in labor markets. While there is considerable variation in school-level outcomes, there is a strong general pattern according to which more advantaged pupils attend higher performing (and especially private unaided) schools. Further, there is greater variation in school performance for schools attended on average by more disadvantaged pupils[15]. This is partly a function of the types of school attended (state government schools are more variable in performance) but it is notable that even within the category of private unaided (and private aided) schools, there is more variance in performance among the schools attended by more disadvantaged pupils. Moreover, a large proportion of state government schools have lower outcomes than almost any private school, in part due to their more disadvantaged pupils. Accordingly, disadvantaged pupils in socio-economic terms apparently attend lower performing schools and schools which are less effective but are also affected by greater uncertainty with regard to school performance.

[15] While all schools with fewer than 15 pupils in Grade 9 at the time of the survey are omitted, there are many relatively small schools in the sample. All pupils in Grade 9 took tests in maths and English at the beginning and end of Grade 9. School-level average scores for small schools may be considered less reliable indicators of school performance than for large schools and variance in average scores for smaller schools in disadvantaged areas may in part drive the patterns presented, while schools of a variety of sizes are found in each category and are attended by pupils from a variety of backgrounds. Full details of the survey are available in Moore et al (2017).

Figure 6: School-Level Performance by Average Pupil Backgrounds (India)[16]

Source: Young Lives Secondary School Survey 2016-17 India (AP and Telangana

In common with the results from SACMEQ III and PISA 2015 science discussed in section 3, Young Lives data suggest that inequality between countries - India and Vietnam and also between schools within India specifically (based on their effectiveness) is large, especially compared to inequality linked to factors such as gender. Moreover, Inequalities driven by system-level factors separate from individual and household disadvantage, especially school quality and school-type, may compound the inequalities associated with individual and household factors.

5. Do countries improve their averages by reducing non-performance or improving high performance?

Previous sections account for sources of inequality in learning outcomes using assessment data but do not discuss the issues as illustrated using metrics focused on minimum standards or the proportion of children falling below particular standards or proficiency benchmarks or indeed the inequalities found using these metrics. In this section we explore whether, in fact, the evidence is that countries improve their average learning outcomes by reducing the proportion of children with low achievement or by increasing the proportion with high achievement. We ask whether improvement in averages is empirically consistent with either increasing equality or reductions in 'absolute' 'learning poverty' or both and explore whether this depends on the levels from which countries start.[17] For a country seeking to improve average performance, there would appear to be an implicit choice to either reduce the proportion of children with extremely poor performance or to increase the proportion with high performance, or something in between. We examine briefly the evidence for these alternative routes.

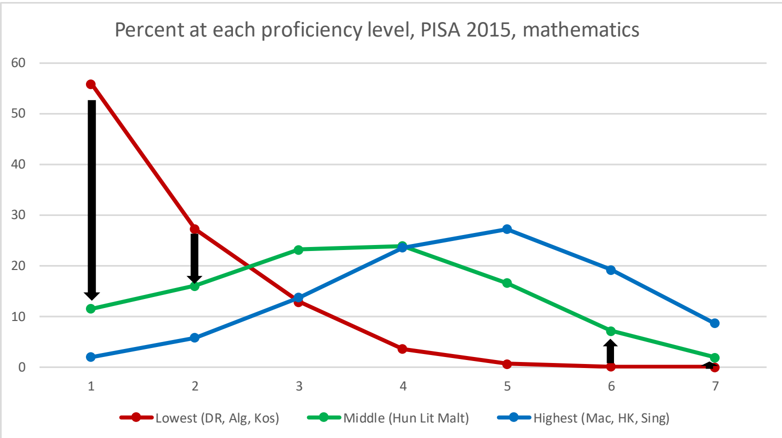
The information on this issue is imperfect, because no assessment includes a representative

[16] TSW: Tribal and Social Welfare schools are government schools usually located in disadvantaged areas serving tribal and disadvantaged populations.
[17] Percentage of children below a certain low threshold on the assessment, as in the absolute poverty lines used in analyses of economic development.

sample of countries in the world. Most of the global assessments contain more high-income and upper-middle income countries than lower-middle income and low-income countries. And few of the very lowest-income or lowest-performance countries participate. There are some regional assessments such as SACMEQ that do include some very low-income countries, but it is not possible to compare this assessment perfectly to the assessments that work in the higher-performing countries. So, all these arguments are imperfect, and will remain so for the foreseeable future. Nonetheless, with the information at hand, we would argue that in most cases, countries improve their averages from low to middle average performance by reducing the proportion of children with very low performance, and only then improve again from middle to high performance by increasing the proportion of children with high performance.[18]

A first take on this is to look at cross sections of countries using aggregate data, as there are far more countries in any cross section than there are countries that have participated in the same assessment over time for two or so decades. We later look at the evidence on country-specific trends. The results for the mathematics assessment in PISA 2015 typify the situation as illustrated in Figure 7.

Figure 7. Percent of children by proficiency level, PISA 2015 mathematics



Source: Crouch and Rolleston (2017), p. 8.

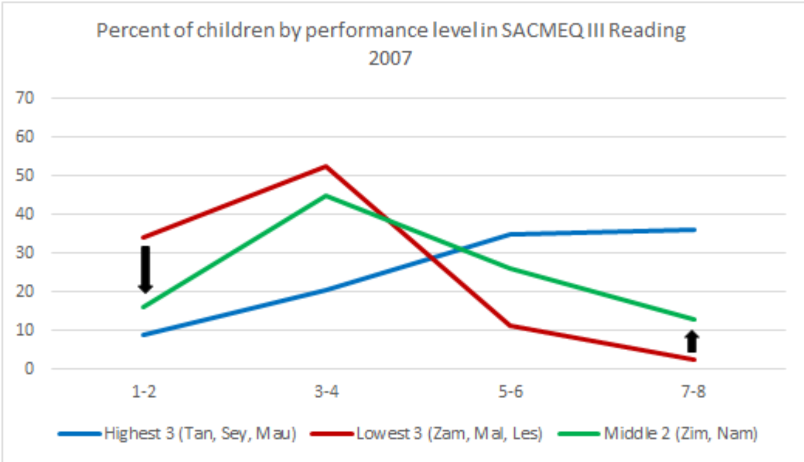
The red line shows the percentage of children at each level of performance, from lowest (1) to highest (7), for the three countries that have the lowest average performance; the green line shows the same thing for the three countries with middle average performance, and the blue line shows the same thing for the three countries with the highest average performance. The graph makes it clear that in going from low (red line) to middling performance (green line), the percentages of children in the two lowest performance levels fall the most: from about 55 to 10 percent and from 25 to 15 percent. But there is hardly any increase the percentages of children in the two highest levels of performance. 45 percent of children are moved out from the lowest two categories, and less than 10 percent are moved into the top two categories. Only in going from middling to high performance (green to blue lines), countries increase the proportion of children in the two highest performance categories.

But this is not always the case, or not so strongly. For example, in the SACMEQ reading assessment, applied in Grade 6 in many Southern and East African countries, we find a similar pattern, but the pattern is much weaker than for PISA 2015 mathematics. Figure 8 shows that in going from low average performance (red line) to middling average performance (green

[18] This line of argument is similar to that crafted by Pritchett and Viarengo (2009b).

line), there is indeed a drop in the percentage of children at the lower levels of performance, as in the PISA data, but the percentage of children in these lowest levels (in SACMEQ) are not very low to start with (only 35 percent as opposed to 55 percent in PISA), the drop is not very big (only from 35 to 18 percent or so, as opposed to going from 55 to 12 percent in PISA), and there is a simultaneous increase in the proportion of children at high levels of performance (red to green line).

Figure 8. Percent of children by proficiency level, SACMEQ 2007 reading[19]



Source: Crouch and Rolleston (2017), p. 9.

This may well be due to SACMEQ simply being an easier assessment for the lowest-performing countries involved, than PISA was for the lowest-performing countries participating in PISA - one should not read too much into this difference between PISA and SACMEQ. Note that while the SACMEQ example here uses mathematics and PISA above used mathematics, the fourteen graphs in Annex 1 of Crouch and Gustafsson (2018) make clear that the results hold for essentially all common assessments in all subjects. In fact the results there are typically stronger than the SACMEQ result shown above—we thought it would be of interest to show one case that is not quite as strong as the others, but still had a noticeable pattern.

Micro (individual children) data, pooling many years

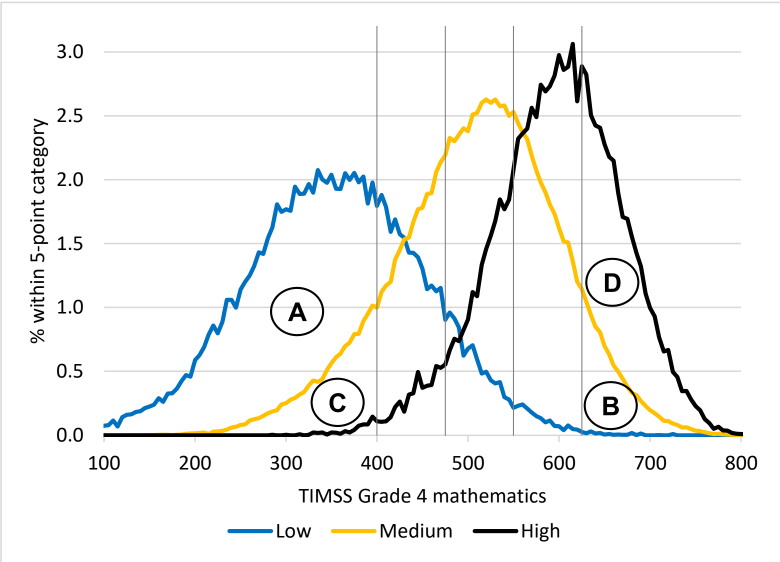
We use data from TIMSS Grade 4 Mathematics, and from SACMEQ Mathematics (pooled across as many years as possible). We illustrate using only TIMSS Grade 4 Mathematics in Figure 9. We show the distribution of students for low-performing, middle-performing, and high-performing countries. In the figure, the vertical bars represent the TIMSS benchmarks. The letters refer to the areas between the curves to the left of the leftmost vertical bar and to the right of the right-most bar, integrated numerically. Area A, therefore, represents the contribution made by shifts in the proportion of students at the low level within countries to movement between low country means and middle country means, area B the contribution made by shifts in the proportion of students at the high level within countries, to movement of countries from low to higher average levels, and so on.[20]

[19] We aggregated the categories for SACMEQ because, perhaps due to the fact that SACMEQ has so many (hence perhaps creating "a distinction without a difference"), that the data were jumpy and it was harder to discern the pattern.

[20] The TIMSS benchmarks for the four bars, and for the selection of countries, are: 625 for Advanced, 550 for High, 475 for Intermediate, and 400 for Low. (Note that they are all spaced 75 points apart.) A 'low' country in the graph below is one with a TIMSS mean below 400 (the official minimum threshold

Both the graph and the table below make it clear that the “gains” at the bottom (A) are between 50% (SACMEQ, which we have seen does not show as strong a pattern as TIMSS and PISA) and 400% larger (TIMSS) than gains at the top (B), in going from low average performance to medium average performance. The opposite is true (areas C and D), but not nearly as strongly, in “going” from medium to high average performance.

Figure 3: TIMSS shrinkage at the bottom versus growth at the top, micro pooled cross-section data



Source: Crouch and Gustafsson (2018), p. 25.

Table 1: Gains at the bottom and top ends

	Low to Medium	Medium to High
TIMSS IRT scores (figure 9)		
Area between two curves below 400	-54 (A)	-13 (C)
Area between two curves 625 and above	10 (B)	27 (D)
SACMEQ IRT score (no figure)		
Area between two curves below 460	-30 (A)	-16 (C)
Area between two curves 530 and above	22(B)	27 (D)
Note: Values refer to the percentage of all pupils.		

Source: calculated by the authors from raw TIMSS and SACMEQ data.

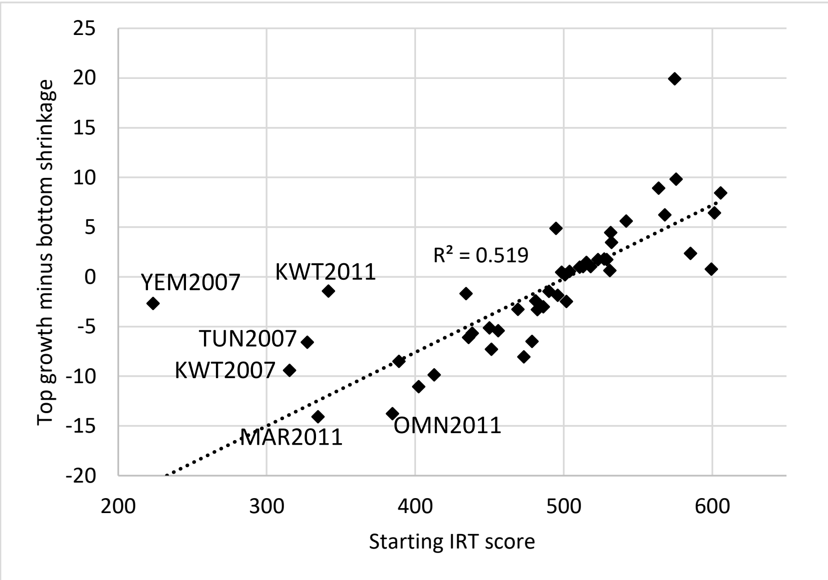
Time series data

The cross-sectional pictures provided above (and in Crouch and Rolleston 2017) suggest that as the educational quality of low-performing countries improves, there should be larger

for qualifying as ‘Low’). A ‘Medium’ country has a TIMSS mean 400 or above, but less than 550 (550 official minimum for ‘High’) and the ‘High’ here is 550 or above.

reductions in weak performance than increases in high performance. This pattern is in fact what one finds if one analyzes actual country-specific changes over time. In the TIMSS Grade 4 data from four separate rounds of TIMSS, there were sixty-one instances of significant change over time represented by two consecutive points in time for the same country. One country could be represented by more than one instance, for example, Qatar saw a significant improvement between 2007 and 2011, and again between 2011 and 2015, creating two instances for Qatar. An average *annualized* gain of 1.5 TIMSS points was used as a threshold for considering a change significant, which would be in line with official TIMSS reports.[21] Of the sixty-one instances, forty-eight involved significant improvements (as opposed to significant declines) and are plotted in Figure 10 below. Of twenty-six instances of improvers where the starting point was less than 500 TIMSS points, all but two involved more shrinkage in the number of pupils below the low TIMSS benchmark (400) than growth in the number of pupils reaching the advanced benchmark (625). The two exceptions represent two rich countries: Austria and Norway.

Figure 10: TIMSS shrinkage at the bottom versus growth at the top, time series data



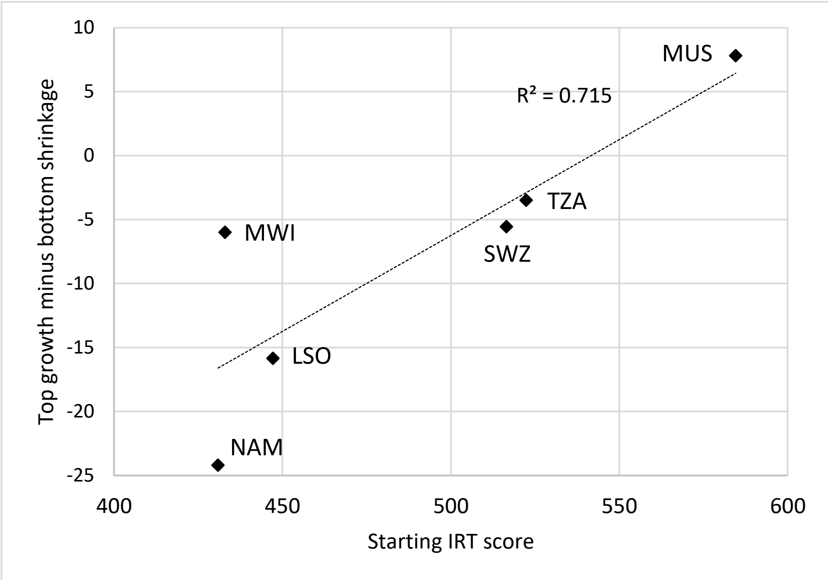
Source: Crouch and Gustafsson (2018), p. 29.

In the Figure 10, depicting TIMSS changes over time, the vertical axis is the increase in the percentage of pupils at or above the advanced benchmark (625) minus the decrease in the percentage of pupils below the low benchmark (400). Thus, a negative value means a decrease at the bottom which exceeds the increase at the top. To illustrate the labelling, 'TUN2007' refers to change between Tunisia in 2007 and the next TIMSS year for Tunisia, which would be 2011. Figure 10 adds to an analysis by Mullis et al (2016b: 58), who examine the improvements amongst TIMSS Grade 4 countries, between 1995 (but in some cases 2003) and 2015, focussing on improvements at the 10th and 90th percentiles. They conclude that national gains are driven more by the desired change at the bottom end of the performance spectrum than the top. Of eighteen countries, all but four saw larger, often much larger, improvements at the 10th than the 90th percentile. The present analysis, by including more developing countries, establishes that the movement is towards less "learning poverty."

[21] Mullis, Martin, Foy and Hooper (2016a), Exhibit for Grade 4 titled 'Differences in Mathematics Achievement Across Assessment Years'.

Just six SACMEQ countries were considered to have made significant improvements in their national mathematics score between 2000 and 2007 (Makuwa 2010). These countries are illustrated in Figure 11 below, which follows the approach of the previous TIMSS graph. Generally, the six SACMEQ countries did see larger reductions at the bottom than gains at the top. The exception is Mauritius (MUS), by far the best performer of all fifteen SACMEQ countries in both 2000 and 2007. The thresholds used to define the bottom and the top for the purposes of this graph were the 460 and 645 SACMEQ scores, minimum values for the official SACMEQ levels 'basic numeracy' and 'mathematically skilled'.

Figure 11: SACMEQ shrinkage at the bottom versus growth at the top, time series



Source: Crouch and Gustafsson (2018), p. 30.

In short, the time series evidence clearly confirms the cross-section data. Dynamically, rather than taking a cross-section as a proxy, the countries that improve the most in moving from low averages to middling averages, do so by curtailing the size of the left-hand bulge in the learning distribution, that is, by reducing the percentage of pupils below a low benchmark. It is important to acknowledge that policies and inputs needed to "bring up the bottom" may be different than those needed were one to opt for improving at the top. Having benchmarks of minimum acceptable levels especially for the foundational skills (localizing SDG 4.1.1, and especially SDG 4.1.1.a., as it were), and having interventions that are capable of addressing low levels of performance, such as "Teaching at the Right Level" might be most appropriate.[22] The next section discusses one example.

6. Emerging evidence from large-scale programmatic interventions

The foregoing sections show country-level, and some child- or school-level, evidence on whether reductions in the proportions of students at or below a low benchmark, or improvements in inequality, are associated with improvements in mean performance. The

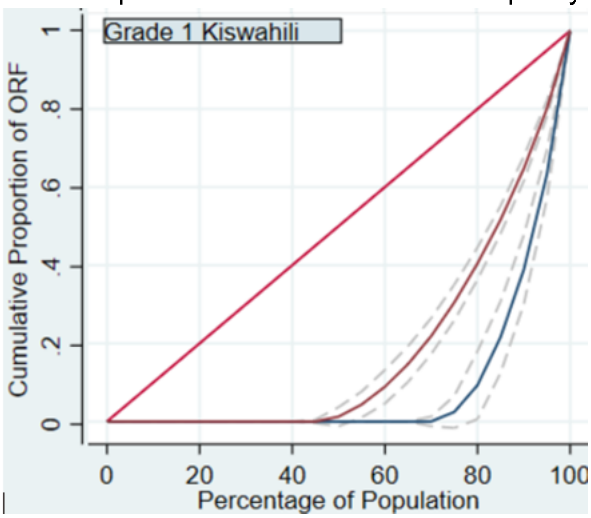
22 For an example of the use of the concept by one of the coiners of the phrase, see: https://www.teachingattherightlevel.org/.

sections conclude that, in particular, reductions in the proportion of children below a certain, low, learning threshold (as opposed to increases in proportions of children above a certain threshold), are associated with gains in mean performance from very low levels to middling levels. But the work summarized does not look at what happens, in terms of inequality or percent of children below a certain threshold, when purposeful and successful interventions to boost learning are implemented and result in significant increases in mean levels of performance. This section highlights emerging evidence from classroom-based gains in skills due to purposeful skills-boosting interventions, using a randomized and before-and-after design.

Crouch and Slade (2020, forthcoming) use specific reading skills in two languages (English and Kiswahili), and two grades (first and second) in two interventions in Kenya, to show a relationship between gains in skills and reductions in the inequality in those skills and percentage of children at or below a very low threshold. The study uses the Gini coefficient as applied to oral reading fluency in a connected text (ORF, a relatively natural metric, as opposed to the created scales in international assessments) as a measure of inequality (ORF, a relatively natural metric), plus the percentage of children unable to read a single word, as well as mean oral reading fluency.

Two specific findings are relevant. The first documents the relationship between the improvements in the mean and the reductions in inequality in reading fluency *and* the percentage of children unable to read a single word: the relationship between improvements in means and changes in inequality is strong (r=-0.65 for the before-and-after differences across languages and grades), is subject to diminishing returns (where inequality was already low it is harder to lower it even more), and was more *predictably* achievable at medium levels of baseline inequality than at very high or very low levels of baseline inequality. The relationship is strong whether one considers inequality as measured by the Gini coefficient or the percent of children unable to read a single word.

Figure 12. Relationship between percent at a low level and inequality



Source: Crouch and Slade (2020, forthcoming)

A second finding pertains to the relationship between inequality and the percent achieving at or below a very low threshold (percent of children unable to read a single word). Figure 12 summarizes this relationship using Lorenz curves for one of the grade-skill pairs (but this is common to all others).[23] The link between the two can be visualized as the placement, on the

[23] For the reader not familiar with inequality analysis: the Lorenz curve is a graphical representation of inequality. It represents the cumulative percentage of skill possessed (the vertical axis) by cumulative sorted (according to the skill level) percentages of the population (the horizontal axis). It is strongly

horizontal axis, of the “kink” at the bottom left of the Lorenz curve. The placement of that kink (or intercept with the horizontal axis) is the percentage of children who cannot read a single word: those to the left of the kink cannot read at all. It can be seen that the placement of that kink accounts for a lot of the difference in the area between the line of equality (the 45-degree line) and the actual distribution of the skill level (the Lorenz curve). Numerically, the percent unable to read at all has been reduced by the intervention from about 70% to about 45% (which can be read from the figure) and the Gini coefficient has been reduced from about 0.8 to about 0.6 (this cannot be read directly from the figure), a reduction of about 25%. It is also clear (though this is more dramatic for this particular skill-grade pair than for others studied thus far) that much of the reduction in the latter is due to a reduction in the former: the Lorenz curve is nearly straight in the “before” case, with an intercept in the horizontal axis, and, in the “after” case it stays nearly straight, but the intercept has been moved significantly to the left, so the area between the Lorenz curve and the line of equality is reduced in a manner directly proportional reduction in the percent of children unable to read a single word.

It is important to note that the interventions producing these results were aimed at improving mean levels, but in populations where these mean levels were very low. The interventions did not target the bottom of the distribution *within* the interventions nor did the worst off within the target population get more intensive assistance. However, the intervention was designed to focus on the most basic and foundational skills, using standards, measurements, and fairly direct and explicit instruction. This may be why they seem to have seem to have provided greater benefits to the neediest and thus reduced inequality of learning outcomes (see Crouch and Slade 2020 for more detail).

Though the evidence here is limited to a single study, it is strongly suggestive of the “micro” reasons why there may be a link between reductions in the proportion of children at or below a low threshold and reductions in inequality, both in turn related to an improvement of the mean levels of performance. The “formal” paper being summarized here is the very first to have ever explored this issue, at least in a developing country, and to our knowledge. Others are working on the subject and presentations exist (see Beggs, C., J. Stern, D. Anand, and M. Punjabi 2020; Punjabi and Ryan 2020).

7. Conclusions: Policy Implications, Suggestions for Further Work

The paper reviews the evidence for the idea that improving equity requires focusing more attention/resources on the disadvantaged, but with disadvantage defined or detected directly by low learning levels more than by social or other ascriptive disadvantage. While important, eliminating certain key inequalities in education in developing countries, such as the ‘gender gap’ in learning outcomes, would be by no means sufficient to ensure adequate learning levels and eliminating such gaps will not solve the learning crisis.

All this means that focusing on ‘systems-related inequality’ and ‘learning poverty’ linked to poor mastery of basic skills as a result of poor-quality schooling is likely to be the most productive approach to improving equity, most clearly understood in terms of minimum standards, but also understood in terms of impartiality and redistribution, when appreciating that inequalities in ‘opportunities to learn’ vary very significantly not only according to individual child characteristics. Notably, when taken together, groups that are disadvantaged, as proxied by the percentage of learners below a low threshold, may well amount to a majority.

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related to the Gini coefficient, but can be more informative. The line of equality, where the percentages of the population are exactly equal to the percentages of skills possessed, are portrayed as a 45-degree line. The more bowed out from this line the Lorenz curve is, the more inequality it represents. The Gini coefficient is simply double the area between the line of equality and the Lorenz curve.

While this paper documents a relationship between inequality, learning poverty, and improvements in mean learning scores at least up to middle levels of average performance, it does not document precisely what drives this relationship, for example in terms of pedagogy or school management in the countries that have made this transition. It appears therefore that there is a lot to learn from what specific countries have done in moving from very low to at least middle levels of performance, and from how they addressed themselves to reducing the proportion of children with very low outcomes, ideally in those countries that have made this transition within recent memory.

It may be important to also state what the paper does not recommend: the paper does not suggest that national planners, or agencies such as the World Bank or the UNESCO Institute for Statistics should routinely calculate the sorts of inequality indicators noted here. The 'percent below a certain level' is already part of the SDGs, but calculation of 'systems-related inequality' is not. Thus, the work ought to be, most likely, of an occasional or specialized nature, at least for now.

Because of their 'triple effects', reducing the links between home disadvantage, school quality, and discrimination may be important. While socio-economic disadvantages can be addressed in the longer term, within the education sector it is important to reduce variability in school quality and to weaken the link between socio-economic status and the quality of school accessed. Countries with large numbers of disadvantaged pupils who perform well may provide lessons here (what PISA calls 'resilience', which is highest in China and Vietnam). Discrimination linked to inappropriate curricula, language, and teacher/school expectations needs to be addressed directly.

Reasons for poor performance (except at the top) might include elitism and over-ambitious curricula (or failure to 'teach at the right level'). Furthermore, high-stakes exams may encourage teachers to 'teach to the top', while lower performing pupils fall further and further behind. Discriminatory language of instruction polices might also play a role—and where mother tongue policies exist in theory, in practice these policies may be badly-implemented (few reading books in pupils' home languages may exist, for instance). Conversely, strategies for 'mass learning' might include using 'minimum (and quite specific) standards' of schools/learning, teachers, management, pedagogy, etc., as well as specific forms of both accountability and support to meet those standards (as opposed to generic support such as more pro-poor spending).

References

Adler, M. J. (1981). Six Great Ideas: Truth, Goodness, Beauty, Liberty, Equality, Justice: Ideas We Judge by, Ideas We Act On. New York: Collier Books.

Beggs, C., J. Stern, D. Anand, and M. Punjabi (2020). Presentation at webinar on "Examining Equality of Learning Outcomes: New Applications of Traditional Methods." Room to Read RM&E In-Progress Series. 16 June 2020.

Boyden, J., & James, Z. (2014). Schooling, childhood poverty and international development: choices and challenges in a longitudinal study. *Oxford Review of Education*, *40*(1), 10-29.

Bruckauf, Z. & Chzhen, Y. (2016). "Education for All? Measuring inequality of educational outcomes among 15-year-olds across 39 industrialized nations." Office of Research - Innocenti Working Paper WP-2016-08, April. Available at https://www.unicefirc.org/publications/pdf/IWP_2016_08.pdf.

Crouch, L. & M. Gustafsson. (2018). "Worldwide Inequality and Poverty in Cognitive Results: Cross-sectional Evidence and Time-based Trends." RISE (Research on Improving Systems of Education) Programme Working Paper, RISE-WP-18/019. https://www.riseprogramme.org/sites/www.riseprogramme.org/files/publications/RISE_WP-019_Crouch-Gustafsson_0.pdf.

Crouch, L. & Rolleston, C. (2017). "Raising the Floor on Learning Levels: Equitable Improvement Starts with the Tail." An Insight note from the RISE Programme. Available at: http://www.riseprogramme.org/sites/www.riseprogramme.org/files/RISE%20Equity%20Insight_0.pdf.

Crouch, L. & Slade, T. (2020, forthcoming). "Documenting and Reducing Inequality in Education Using "Smaller, Quicker, Cheaper" Assessments." Paper presented at the Second International Conference on Learning at the Bottom of the Pyramid, UNESCO, Paris.

Das, J., & Zajonc, T. (2008.) "India Shining and Bharat Drowning: Comparing Two Indian States to the Worldwide Distribution in Mathematics Achievement." World Bank Policy Research Working Paper. Report Number WPS4644. Available at: http://documents.worldbank.org/curated/en/793661468108271189/pdf/wps4644.pdf.

Ferreira, F.H.& Giroux, J. (2011.) The Measurement of Educational Inequality: Achievement and Opportunity. IZA Discussion Paper No. 6161. Available at: http://ftp.iza.org/dp6161.pdf

Freeman, R.B., Machin, S.J. & Viarengo, M.G. (2011). Inequality of educational outcomes: International evidence from PISA. Regional and Sectoral Economic Studies, 11(3): 5-20.

Glewwe, P., S. Krutikova, & C. Rolleston (2017). Do schools reinforce or reduce learning gaps between advantaged and disadvantaged students? Evidence from Vietnam and Peru. Economic Development and Cultural Change, 65(4).

Kolakowski, L. (1997). Modernity on Endless Trial. University of Chicago Press (1997).

Makuwa, D.K. (2010). Mixed results in achievement. IIEP Newsletter, XXVIII(3). Available from: http://www.iiep.unesco.org.

Micklewright, J. & Schnepf, S. (2006). Inequality of Learning in Industrialised Countries. IZA Discussion Paper Series, No. 2517. Available from https://www.researchgate.net/publication/5136840_Inequality_of_Learning_in_Industrialised_Countries.

Moore, R., Azubuike, O. B., Reddy, P. P., Rolleston, C., & Singh, R. (2017). Young Lives School Survey, 2016–17: Evidence from India. Young Lives: Oxford. Available at: https://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-

School%20Survey-CountryReport-India-17.pdf
Mullis, I.V.S., Martin, M.O., Foy, P. & Hooper, M. (2016a). TIMSS 2015 international results in mathematics. Chestnut Hill: Boston College. Available from: http://timss.bc.edu.
Mullis, I.V.S., Martin, M.O., & Loveless, T. (2016b). 20 years of TIMSS: International trends in mathematics and science achievement, curriculum and instruction. Chestnut Hill: Boston College. Available from http://timssandpirls.bc.edu/timss2015/international-results/timss2015/wp-content/uploads/2016/T15-20-years-of-TIMSS.pdf.
OECD. (2016). PISA 2015 Results (Volume I): Excellence and Equity in Education. Paris: OECD Publishing. Available at https://www.oecd.org/education/pisa-2015-results-volume-i-9789264266490-en.htm.
Oppedisano, V. & Turati, G. (2015). What are the causes of educational inequality and its evolution over time in Europe? Evidence from PISA. Education Economics, 23(1): 3-24.
Pritchett, L. and Viarengo, M. (2009a). Producing Superstars for the World Economy: the Mexican Predicament with Quality of Education. In: Hausmann, Ricardo and Emilio, Lozoya Austin and Mia, Irene, (eds.) The Mexico Competitiveness Report 2009. World Economic Forum, Geneva, Switzerland.
Pritchett, L. and Viarengo, M. (2009b). The Illusion of Equality: The Educational Consequences of Blinding Weak States. Center for Global Development Working Paper 78.
Punjabi, M. and J. Stern. (2020). Presentation at webinar on "Examining Equality of Learning Outcomes: New Applications of Traditional Methods." Room to Read RM&E In-Progress Series. 16 June 2020.
Punjabi. M. and J. Ryan. (2020). "Inequity in Learning Outcomes: Setting Baselines and Measuring Changes." Presented at the Comparative and International Education Society virtual conference, March 2020.
Rawal, S., & Kingdon, G. (2010). Akin to my teacher: Does caste, religious or gender distance between student and teacher matter? Some evidence from India (No. 10-18). Department of Quantitative Social Science-UCL Institute of Education, University College London.
Rawls, J. (1971). A Theory of Justice. Cambridge, Mass.: Belknap Press of Harvard University Press.
Rolleston, C., & Krutikova, S. (2014). Equalising opportunity? School quality and home disadvantage in Vietnam. *Oxford Review of Education*, *40*(1), 112-131.
Rolleston, C., & James, Z. (2015). After access: Divergent learning profiles in Vietnam and India. *Prospects*, *45*(3), 285-303.
Rolleston, C. (2016). Escaping a low-level equilibrium of educational quality. RISE Working Paper 16/008. Available at : https://www.riseprogramme.org/sites/www.riseprogramme.org/files/publications/RISE_WP-008_Rolleston.pdf
Rolleston, C. and Moore, R (2018). Young Lives School Survey, 2016-17: Value-added Analysis in India. Young Lives Research Report. Available at: https://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-ValueAddedAnalysis-India.pdf
Sahn, D.E. & Younger, S.D. (2007). Decomposing world education inequality. Ithaca: Cornell University. Available from: <http://www.cfnpp.cornell.edu/images/wp187.pdf> [Accessed June 2017].
Sandefur, J. (2016). Internationally Comparable Mathematics Scores for Fourteen African Countries. Centre for Global Development Working Paper. Washington, DC: CGD
Sen, A. (1985). "Rights and Capabilities." In Honderich T., Morality and Objectivity. London: Routledge.

Sen, A. (1989). “Development as Capability Expansion,” Journal of Development Planning 19: 41–58.

Singh, A. (2014). Emergence and Evolution of Learning Gaps across Countries Panel Evidence from Ethiopia, India, Peru and Vietnam. Young Lives. Available at: www.younglives.org.uk/files/YL-WP124_Singh_learning%20gaps.pdf.

Thomas, V., Y Wang, and X. Fan (2001): Measuring Education Inequality: Gini Coefficients of Education. Policy Research Working Paper No.2525. Washington, DC: The World Bank.

Thomas, V., Y Wang, and X. Fan (2003): Measuring Education Inequality: Gini Coefficients of Education for 140 countries, 1960-2000. Journal of Education Planning and Administration, Vol.17, No.1, pp.5-33.

UNESCO. (2017). “More Than One-Half of Children and Adolescents Are Not Learning Worldwide.” Fact Sheet No. 46, UIS/FS/2017/ED/46. Available at: http://uis.unesco.org/sites/default/files/documents/fs46-more-than-half-children-not-learning-en-2017.pdf.

UIS (UNESCO Institute of Statistics), FHI 360, Oxford Policy Management (OPM), Research for Equitable Access and Learning (REAL) at the University of Cambridge. (2018). Handbook on Measuring Equity in Education, Montreal: UIS. Available at: http://uis.unesco.org/sites/default/files/documents/handbook-measuring-equity-education-2018-en.pdf

Wagner, D., S. Wolf, and R. Boruch (2018). Learning at the bottom of the pyramid: science, measurement, and policy in low-income countries. UNESCO. IIEP.

Wagner, D. A. (2017). Learning as Development: Rethinking International Education in a Changing World. United Kingdom: Taylor & Francis.

Wagner, D.A. (2013). “Improving Policies and Programs for Educational Quality: An Example from the Use of Learning Assessments.” In P. Britto, P. Engle, & C. Super (eds): Handbook of Early Child Development Research and Its Impact on Global Policy. Oxford: Oxford University Press

Wagner, D.A. (2011). Smaller, quicker, cheaper: Improving learning indicators for developing countries. Washington/Paris: FTI/UNESCO-IIEP. http://unesdoc.unesco.org/images/0021/002136/213663e.pdf.

Wagner, D. A. (2003). Smaller, quicker, cheaper: Alternative strategies for literacy assessment in the UN Literacy Decade. In special issue on "Literacy Proficiency: Investigations Using Direct Measures Of Skills", International Journal of Educational Research, 39, 3, pps 293-309. http://authors.elsevier.com/sd/article/S088303550400031X

World Bank. (2018). World Development Report 2018: Learning to Realize Education’s Promise. Washington, DC: World Bank. doi:10.1596/978-1-4648-1096-1. License: Creative Commons Attribution CC BY 3.0 IGO.

World Bank. (2019). “Ending Learning Poverty: What Will It Take? Conference Version. Washington, D.C.: The World Bank. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/32553/142659.pdf?sequence=6&isAllowed=y.