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What works to improve the quality of student learning in developing countries?

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Abstract: We conducted a systematic review to identify policy interventions that improve education quality and student learning in developing countries. Relying on a theory of change typology, we highlight three main drivers of change of education quality: first, supply-side capability interventions that operate through the provision of physical and human resources, and learning materials; second, policies that through incentives seek to change both teachers, household and student behaviour and intertemporal preferences; and third, bottom-up and top-down participatory and community management interventions, which operate through decentralization reforms and knowledge diffusion and increased community participation in the management of education systems. Overall, our findings suggest that policy interventions are more effective in improving student performance and learning when two or more drivers of change are combined. Supply-side interventions are more effective when they are complemented with community participation and/or incentives. Thus, idiosyncrasies, social norms and intertemporal preferences need to be factored in when designing education policies in developing countries.

Keywords: education quality, student learning, education policy, developing countries, systematic review

JEL classification I25, I28, I38, C10, O50

Tables and figures appear at the end of the paper.

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1 Introduction

Since the seminal work of Becker (1962) and Schultz (1961) on the theory of human capital, education policy has been recognized for its intrinsic values and instrumental qualities for the functioning of individuals and societies more generally. Theoretical economic models have emphasized the role of schooling in determining the returns to education that ultimately foster economic growth (Lucas 1988; Becker et al. 1990; Rebelo 1991; Romer 1994). Empirical studies show that education and the policies that facilitate the process of innovation, knowledge creation, and information have profound effects on the long-run patterns and future prospects of economic growth and development (Barro 1991; Rebelo 1991; Benhabib and Spiegel 1994; Barro and Sala-i-Martin 1998). The benefits of information and knowledge in facilitating people's participation in economic transactions, productive arrangements, social interactions, and political participation are also widely acknowledged (Sen 1999).

Investing in human capital through education policy—often supported by foreign aid—has been a growing priority for developing countries since the post-war era. During the 1970s and 1980s, and with many African nations achieving independence from colonial powers, much of the education aid focused on improving access to education via supply-side policies, particularly building schools and providing equipment and technical assistance (Coombs 1985; Tilak 1988). These policies were expected to lead to enhanced productivity, economic growth, and development. Improving teaching abilities via training of teachers and learning materials were seen as the most effective way of enhancing educational quality in developing countries (World Bank 1980). Nearly 50 per cent of bilateral co-operation went during that period to secondary and nearly a third, to tertiary and technical education as these sectors were regarded as catalytic for growth and development (OECD 2012).

It was not until the late 1980s, when primary education was found to have the highest economic returns among developing countries, that education aid and public policies in general began to shift towards improving access to primary education (Psacharopoulos 1981; 1985; Psacharopoulos et al. 1986; Petrakis and Stamatakis 2002; Psacharopoulos and Patrinos 2004; Asiedu and Nandwa 2007). That was followed by the World Declaration on 'Education for All' in 1990 adopted by UNESCO and other multilaterals, and more recently the Millennium Development Goals (MDGs) where access to education has been depicted as a cornerstone for expanding human capabilities and freedoms (UNESCO 2007). This approach has since become the dominant paradigm of education aid in the developing world (Riddell and Niño-Zarazúa 2015).

More recently, the discussion on education aid in policy circles has been gradually shifting from access to schooling to improving the quality of learning. This transition in policy thinking is likely to dominate as education paradigm for the post-2015 global development framework. This shift is not surprising, and can be explained by two important interrelated factors.

First, the growing evidence pointed out that quality of education is what matters for economic growth and development outcomes. Hanushek and Kimko (2000) and Barro (2001) for example, find that test scores are better predictors of growth rates of real per capita GDP than years of school attainment. Hanushek and Woessmann (2008, 2012), Hanushek et al. (2010), Jamison et al. (2007), Laurini and de Carvalho Andrade (2012), UNESCO (2011), among others, also show that cognitive skills are more strongly associated with increases in earnings and development outcomes than school attainment. Second, the disturbing fact that poor quality of education remains endemic in most developing countries. UNESCO (2014) recently reported that nearly 250 million children

are functionally illiterate and innumerate despite that about half of them spent at least four years in school. In India, more than half of students at grade five read at grade two level (ASER 2015).

Policy strategies designed to improve teacher qualifications and improve their attendance have received much attention, given the poor teachers' qualifications across developing countries. UNESCO (2014), for instance, reports that in around a third of developing countries, less than 75 per cent of primary school teachers have been trained according to national standards. Glewwe et al. (2010) also report that teachers from rural schools in Kenya were absent 20 per cent of the time. Similarly, in Zambia, Das et al. (2007) show that teachers were absent 18 per cent of the time while in Pakistan the absence rate was in the order of 10 per cent at primary level (Reimers 1993).

Other supply-side conditions such as overcrowded classrooms, lack of teaching materials and poor infrastructure are also important obstacles for good learning environments. In sub-Saharan Africa, the rapid school enrolment rates that have been accompanied with low teacher recruitments has meant that the pupil-teacher ratios in primary education are now exceeding 40:1, the highest ratios in the world (UNESCO 2014). Demand-side considerations such as social norms, group incentives and intertemporal preferences can also influence the utilization of education services.

Previous analytical review studies have extensively examined the relationship between policy design and cognitive skills and learning at various levels of education while focusing largely on supply-side interventions (Glewwe 2002; Kremer 2003; Glewwe and Kremer 2006; Kremer and Holla 2009; Glewwe et al. 2014). Recent systematic reviews have focused on a number of issues including (i) assessing the effectiveness of policies that improve enrolment in primary schools (Petrosino et al. 2012); (ii) supply-side and demand-side considerations for school attendance and learning (Krishnaratne et al. 2013); (iii) school-based interventions looking exclusively at the evidence from randomized control trials (McEwan 2014), and (iv) studies with a specific regional focus (Conn 2014).

This study contributes to the existing literature by conducting a systematic review of the literature on education policies that specifically aim to improve the quality of student learning at basic education level in developing countries. Our study collects evidence from experimental and quasi-experimental studies of programmes that have been funded either exclusively with foreign aid or national governments alone or with the support of donors. Overall, we find that student learning performance is more effectively enhanced when two or more policy strategies are combined. In particular, idiosyncrasies, social norms and intertemporal preferences need to be factored in when designing supply-side and community participation policies.

The remaining of the paper is organized as follows: Section 2 presents a theory of change typology that outlines the underlying drivers that facilitate improving education quality in developing countries. Section 3 presents the systematic review methodology, whereas Section 4 presents the synthesis of evidence, which is divided into three groups: (i) supply-side capability interventions; (ii) incentives for changing preferences and behaviours, and (iii) participatory and community management interventions. Finally, Section 5 concludes with a discussion on the overall findings and the implications for policy.

2 Policy innovations to improve education quality and student learning: A theory of change typology

We begin the discussion by developing a theory of change typology based on the systematic review. The theory of change involved first, the identification of the targeted outcome, which in our case is student achievement as measured by test scores in reading, writing and mathematics. Second, the theory of change identified various transmission channels through which policy strategies impact education quality in developing country contexts. Typically, a variety of interlinked factors affect the desirable outcomes overtime; therefore, it was important to disentangle the short-term from the medium- and long-term objectives that also influence targeting mechanisms and the process of impact evaluation of policies.

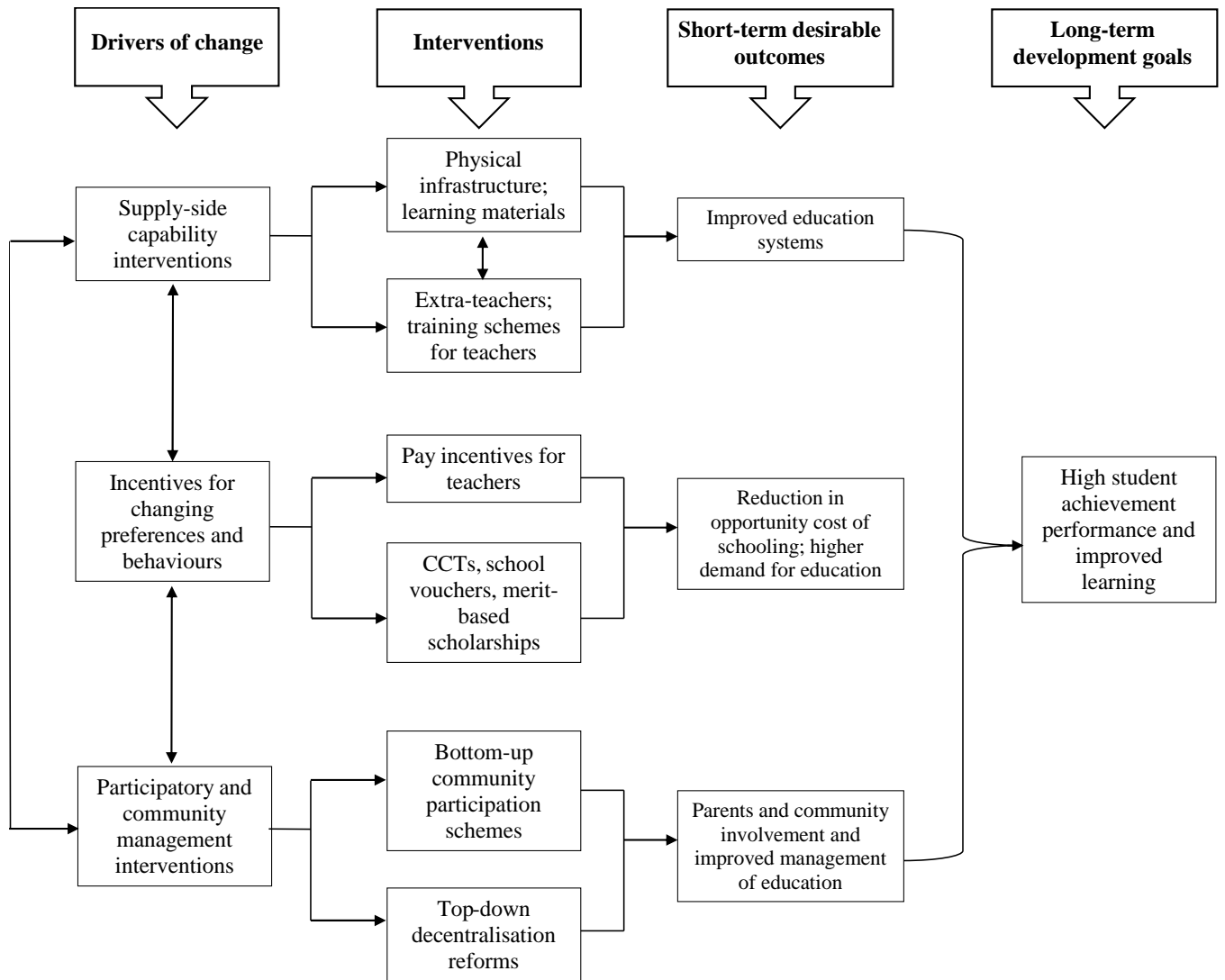
From the systematic review analysis, we were able to identify three main drivers of change for advancing education quality and student learning in developing countries. These involved: (i) interventions aimed to enhance the supply-side capabilities of education institutions, (ii) interventions aimed at changing demand-side factors that affect the utilization of education services such as inter-temporal preferences, social norms and household behaviour via incentives, and (iii) bottom-up and top-down participation and management interventions (see Figure 1). In the following sections we discuss these drivers of change in more detail.

2.1 Supply-side capability interventions

Supply-side interventions aim to raise student achievements by targeting infrastructure or organizational deficiencies through, for example, improving physical infrastructure, providing teaching materials, and training and hiring extra teachers. Financial resources provided by governments and/or aid-funded programmes can take the form of directed or generalized financial allocations to improve physical conditions of existing schools (as in Paqueo and Lopez-Acevedo 2003; Barrera-Osorio 2007, and Bjorkmann 2004) or involve the construction of new schools (as in Burde and Linden 2012). Studies have also examined the allocation of financial resources to provide school materials such as computers, flip-charts, and textbooks, which support the learning process and improve teaching quality (see e.g. Barrera-Osorio and Linden 2009; Glewwe et al. 2004; Vermeersch and Kremer 2004; Glewwe et al. 2009; Evans et al. 2009; Banerjee et al. 2007; Linden 2008; He et al. 2008; and Muralidharan and Sundararaman 2010).

Supply-side education policies have also focused on hiring extra teachers, so as to decrease the prevailing high teacher-pupil ratios in many developing countries, and also complement permanent teachers with younger, often more motivated, temporary teachers (see e.g. Duflo et al. 2012a; Asadullah 2005; Linden 2008; Muralidharan and Sundararaman 2010; 2011). Finally, supply-side policies have also taken the form of management related interventions aiming to improve the functioning and efficacy of education systems as a whole (Palomer and Paredes 2010; King and Ozler 1998; Galiani et al. 2008; Lassibille et al. 2010). This type of interventions can be seen as cross-over policy between resource-provision and participation-related drivers of change.

Figure 1. Theory of change flow diagram



Source: Authors' compilation.

2.2 Incentives for changing preferences and behaviours

Monetary incentives have been used to produce changes in the behaviour and preferences of the actors involved both in the provision and utilization of education services, namely teachers, students and parents. Incentives for teachers focus on the supply-side of education systems whereas incentives for students and parents are concerned with behaviours and preferences that affect the demand for education services. Several studies have highlighted the fact that in contexts where the demand for educational services is constrained by societal and economic factors, the mere supply of physical and human resources can often result in waste of limited resources (Vermeersch and Kremer 2004, Glewwe et al. 2009, Muralidharan and Sundararaman 2010).

Teachers' commitment to attend the classroom regularly can depend on a number of factors, including the level of wages and the nature of their contracts (permanent vs temporary), the distance to the workplace and school facilities, and the existence of systems to monitor their work shifts and attendance. In some contexts, the provision of monetary incentives can be effective devices to discourage absenteeism. In other contexts, teachers may respond better to non-

monetary incentives such as monitoring and paying sanctions and other enforcement mechanisms, although such policies are found to fail achieve long-term improvements in students learning, and just encourage teachers to boost students' short-term performance, so as to meet the target to which the incentives are tied up (Rau and Contreras 2009; Glewwe et al. 2010; Kingdon and Teal 2007; Duflo et al. 2012b; Muralidharan and Sundararaman 2011).

Similarly, a number of strategies have been deployed using a mix of targeting strategies to change the behaviours of students and their parents. For example, school voucher programmes, such as Colombia's PACES programme, analysed by Angrist et al. (2002) and Angrist et al. (2006), or Chile's school voucher scheme discussed by Contreras (2001), Hsie and Urquiola (2003), and Anand et al. (2009) aim to facilitate poor students attendance to better (often private) schools. School vouchers work through two parallel mechanisms: first, they provide students with the financial resources needed to attend schools in more conducive environments. Second, they lower the opportunity cost of students due to intertemporal preferences over labour supply.

Conditional cash transfers (CCTs), and merit-based scholarships and grants are also designed to induce behavioural changes towards an increased utilization of education services (Das et al. 2004; Kremer et al. 2009; Baird et al. 2011). In those cases, the financial support is conditional upon, or tied to, student and household behaviour including school attendance, grade progression, or test score attainment. In this way, students' choices are directly targeted to bring about the desired change in behaviour. As depicted in Figure 1, by coupling behavioural incentives with financial resources at the school level, school vouchers, CCTs, and merit-based scholarships effectively cross-over the supply-side of interventions.

2.3 Participatory and community management interventions

The third driver of change runs through bottom-up or top-down participatory and community management interventions. On the one hand, bottom-up policies diffuse and disseminate relevant information among actors to raise awareness of community needs for quality education services and the possible solutions. Often through initiatives that are jointly executed with incentives for changes in preferences and behaviours, bottom-up participatory interventions seek to change social norms and undesirable behaviours that restrict the demand for education services. Some examples of bottom-up interventions have been studied in Jimenez and Sawada (1999) and Di Gropello and Marshall (2005).

On the other hand, top-down interventions channel or optimize resources through management reforms or standards of practice for policy implementation that are often complemented with provision of resources that involve community participatory components, as they try to rationalize the service flow of education systems. Some examples of these interventions are discussed in Palomer and Paredes (2010); King and Ozler (2005); Galiani et al. (2008); and Lassibille et al. (2010). Participatory community management interventions can thus often be seen as an integrated component to both supply-and demand-side drivers of change, insofar as they generate conducive environments for social change.

3 Methodology

We conducted a systematic review of the literature on the quality of student learning following the Cochrane Handbook for Systematic Reviews of Interventions (Higgins and Green 2008), and the PRISMA guidelines (Moher et al. 2009) of the largest relevant databases available, including

Econlit, Social Science Citation Index, JSTOR, SCOPUS, Eldis, 3ie database, J-PAL Library , and Google Scholar.

As search criteria, we included academic articles that adopted a rigorous quantitative impact evaluation design to assess the effectiveness of policies to improve education quality in pre-school, primary and secondary education, and which were published in English. Given that in the initial search no paper was identified before 1990, the search criteria were limited from 1990 onwards. In order to diminish the risk of publication bias, we included unpublished studies (grey literature), such as working papers. Non-academic policy documents such as policy briefs and reports that lack rigorous methodology were excluded from the review.

The search protocol was complemented with a hand search of reference lists of previous review studies to identify additional relevant material. The initial search was repeated at a later stage on February 2013 to update the review. To make the searching process more efficient, we combine a number of study ‘identifiers’ that included (i) research design—e.g. RCTs, randomized experiment, randomized controlled trial, quasi-experimental method, difference-in-differences, regression discontinuity design, matching methods, instrumental variables, structural equation modelling; (ii) type of intervention—e.g. improved school infrastructure, allocation of extra teachers, school meals, school fees, textbooks, school vouchers, conditional cash transfers; (iii) outcomes—e.g. reading, mathematics and writing test scores; (iv) education level, which was limited to primary school and secondary school, and (v) the context of intervention—e.g. rural vs. urban settings, middle-income or low-income countries, Africa, Asia, Latin America, Middle East. Group identifiers were combined with the Boolean operator ‘AND’, while they were connected with the Boolean operator ‘OR’.

We selected 220 studies for screening on the basis of their abstracts and keywords, out of 17,800 identified studies. Of the 220 studies, 146 were excluded due to methodological limitations, leaving 74 studies that were fully scrutinized on the basis of their content. 36 additional studies did not meet the eligibility criteria in terms of outcomes; research design and coverage, leading to 38 studies that were included for analysis in the systematic review (see Figure 2).

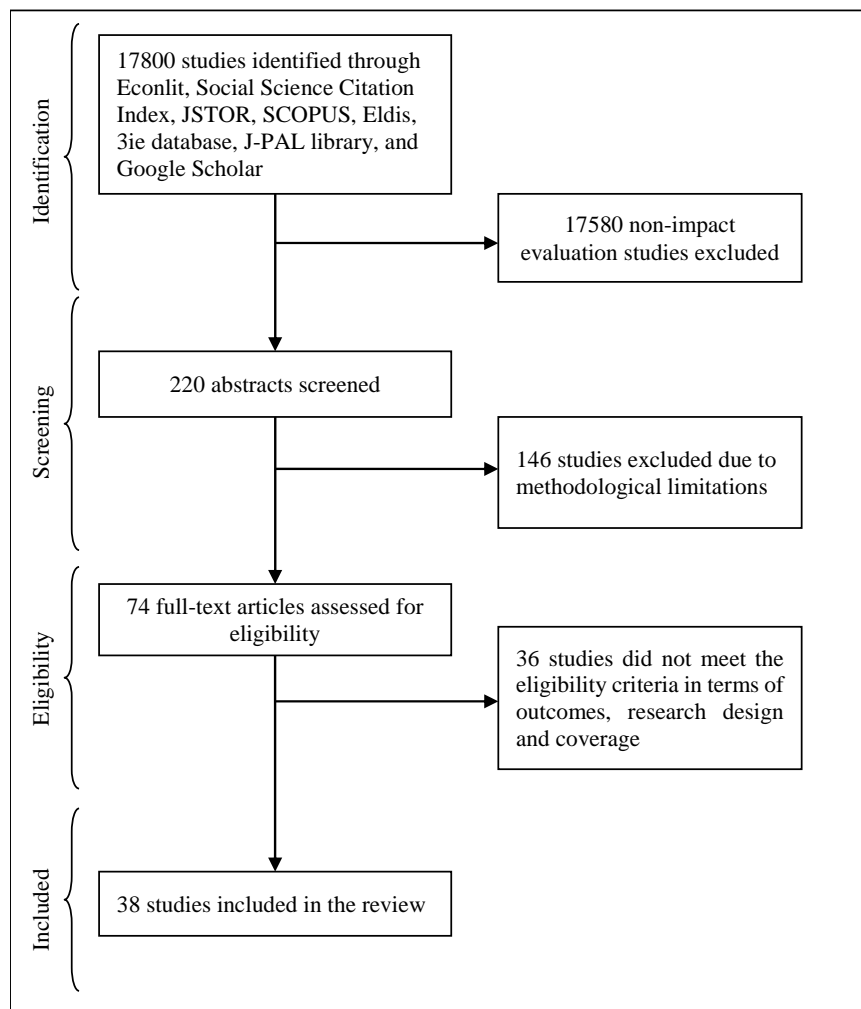
As the primary objective of this study is to review education policies that improve the quality of learning in basic education levels in developing countries, we only included studies that focused on student achievement test scores as impact outcomes. We excluded other outcomes, such as school enrolment and attainment, pupil-teacher ratios, drop-out rates, and repetition rates. This is due to the fact that student achievement test scores are better proxies for learning performance on subjects such as mathematics and language skills. Test scores can be either administered by official institutions that oversee students’ grade progression, or during pre- and post-implementation phases of policies that are analysed by researchers in the context of independent evaluations.

It is important to point out that there are a number of issues regarding the comparability of student achievement test scores across contexts, learning subjects, and grades. For instance, student achievement test scores for primary school levels do not reflect the same cognitive progression of secondary school levels. Comparing the two or pooling them together in the same analysis would yield misleading conclusions. Internationally standardized tests are available for a relative small number of industrialized and middle income countries.¹ However, as discussed in Dhaliwal et al. (2012), they are not strictly comparable with most student achievement test scores available in

¹ For example, the Programme for International Student Assessment (PISA)

developing countries. The standardization of measures, via standard deviations (SD) can nevertheless help us compare the effectiveness of policies across different types of tests and contexts. The standard deviation would indicate the amount of variation in student learning as a result of a programme, compared to changes in learning observed among a control group. Dhaliwal et al. (2012) report that a 0.2 SD change in test scores would amount to a child moving from the 50th to the 58th percentile of her group test score distribution. They highlight the fact that in the education literature, an increase of less than 0.1 SD is typically considered to be a small effect, while an increase of more than 0.3 SD is considered a large effect. An increase of more than 0.5 SD is regarded as a very large effect.

Figure 2. Systematic review flow diagram



Source: Authors' compilation.

Therefore this study focuses on experimental or quasi-experimental studies that use standard deviations of student achievement test scores to measure policy impact. This is with the aim of rendering more reasonable cross-country comparisons of policy impact, without undermining the relevance of other studies that have adopted other qualitative methods of research enquiry. The study also adopts a geographical inclusion criterion in the sense that it only focuses on studies conducted in developing countries. To this purpose, we followed the World Bank's Atlas

classification system, which is based on gross national income (GNI) per capita to classify countries as low-income, lower middle-income, and upper middle-income.²

Out of the 38 selected studies, 23 adopted experimental designs whereas the other 15 followed quasi-experimental methods. The large number of recent studies included in the review reflects the increasing interest in issues related to education quality among the research community. With regard to the geographical coverage, the review included studies conducted in 15 countries located in three major geographical regions: Central Asia (Afghanistan) and South Asia (Bangladesh, India); Latin America (Argentina, Chile, Colombia, El Salvador, Honduras, Mexico, Nicaragua), and Sub-Saharan Africa (Kenya, Madagascar, Malawi, Uganda, Zambia). No studies conducted in Middle Eastern or North-Africa were identified, while some studies in Central or East Asia did not meet the inclusion criteria.

4 Synthesis of evidence

In this section, we discuss the synthesis of evidence, following the typology of policies depicted in the theory of change of Section 2. The first group of policies aims to improve education quality through the strengthening of supply-side capabilities of education systems via, for example the provision of computers (as in Barrera-Osorio and Linden 2009) or extra teachers (as in Duflo et al. 2012a). The second group of policies aim to influence individual preferences and behaviours via incentives. Examples of this type of policies are school voucher programmes (as in Contreras 2001), or payment incentive schemes for teachers (Kingdon and Teal 2007). A third group of policies is integrated from participatory and community interventions with the objective of improving the management of education systems. Examples of these policies are country-wide school decentralization reforms (Galiani et al. 2008), and community involvement programmes (Di Gropello and Marshall 2004; Jimenez and Sawada 1999). A synthesis of evidence is presented in Appendix Table 1.

4.1 Supply-side capability interventions

A number of studies examine policies that provided additional resources for schools and teachers in an attempt to improve education quality and student learning. Changes in outcomes varied across contexts, but overall, the analysis suggests that it is not sufficient to limit policy strategies to the provision of supply-side capabilities. For instance, Asadullah (2005) reports that in Bangladesh secondary school achievement test scores were not improved after reductions in class-size. The author attributed the result to the lack of complementary learning materials and teaching improvements. Similarly, Muralidharan and Sundararaman (2010) found in India that teacher-aid tools such as exam performance diagnostics began to produce positive effects only after they were complemented with payment incentives tied to student achievement performance.

It appears that demand-side considerations often undermine the effectiveness of supply-side capability interventions. This was particularly evident for policies that exclusively provide school materials. In fact, some of these policies resulted in exclusion errors, typically of the weakest students. For example, the Mexican compensatory programme (PARE) analysed in Paqueo and

² Based on 2011 data on GNI per capita, developing countries were classified as follows: low-income countries were those with annual GNI per capita of US\$1025 or less; lower middle income countries were those with GNI per capita between US\$1026 and US\$4035; and upper middle income countries were those with GNI per capita in the range of US\$4036 and US\$12,475. For more information, see <http://data.worldbank.org/about/country-classifications>

Lopez-Acevedo (2003) aimed to improve access to, and quality of schools in the four poorest Mexican states, by providing financial resources. But the adopted top-down targeting mechanism failed to reach out the poorest students. Similarly, the textbook distribution intervention reported in Glewwe et al. (2009) only increased the performance of the strongest, often better-off students, as poorer students were unable to properly understand books written in English. Other interventions failed to produce significant gains in student learning because key complementary resources were needed before inputs, such as flip-charts, could result in a significant learning improvement (Glewwe et al. 2004).

Nevertheless, a group of supply-side capability interventions did succeed in raising student achievement test scores. For example, the PACE-A programme analysed in Burde and Linden (2012), which involved the construction of village-based community schools in rural north-western Afghanistan, produced a very sizable effect on both boys' and girls' school test scores. The main channel through which the programme had an impact was the reduced transaction costs in terms of distance and travelling time pupils had to spend to attend traditional public schools, which are usually located further away from rural communities. Additional positive evidence from supply-side interventions came from Kenya, where school meals and school uniforms appear to increase students' performance (Vermeersch and Kremer 2004; Evans et al. 2009), although Vermeersch and Kremer (2004) point out that the gains brought about by school meals in pre-primary schools were mainly due to an induced increased attendance, rather than the result of improvements in cognitive abilities through nutritional intake.

Also in Kenya, Duflo et al. (2012a) found that additional non-civil-service contract teachers hired by parent-teacher associations increased test scores only for those students that were assigned to the new teachers, which seems to be explained by the fact that contract teachers often put more effort in their teaching than permanent teachers, in order to get promoted to receive a permanent contract. The reduced class size that followed the hiring of extra teachers did not, however, have any sizable positive effect on student performance, a result which is consistent to the evidence reported in Asadullah (2005).

A number of recent studies have examined whether teaching quality could be enhanced through compensatory or 'remedial' education schemes, or through new teaching methods such as flashcard and computer-assisted learning. The outcomes of such programmes are generally positive, with gains in both maths and language test scores. Something that emerged in more than one study is that, when interventions substitute teachers' inputs, their efficacy was lower than when they complemented them (Linden 2008; He et al. 2009). For example, the study by Muralidharan and Sundararaman (2011) found that although providing extra schooling materials helped improve student performance, additional contract teachers was a more effective policy to improve the quality of learning. Furthermore, the effectiveness of remedial education schemes were found to be largely driven by the lowest performing pupils who seemed to have benefited the most from the programmes (Banerjee et al. 2007, He et al. 2008). On the contrary, self-paced computer assisted learning programmes like the one analysed in He et al. (2008) were found to help the strongest students the most.

4.2 Incentive for changing preferences and behaviours

We find that contrary to supply-side capability interventions, incentive interventions have been extensively implemented at secondary school levels. This seems to reflect programme design features intended to induce shifts in individual and household behaviour and preferences, particularly at the time when the opportunity cost of schooling for low income households begins to increase. Incentive interventions have focused on the prevailing supply-side constraints of

education systems, and/or demand-side considerations that limit the learning process in the classroom.

Supply-side incentives

Paying incentives to teachers has been implemented with the aim of improving teacher attendance and performance, this has, however, produced mixed results. In Chile, pay-incentive tournaments were introduced in secondary schools. The scheme provided monetary incentives to teachers who improved the performance of secondary school students over the course of a year. The gains in test scores were, however, only short-lived and likely to be the result of teachers' opportunistic behaviour, whose actions were primarily motivated by the goal of succeeding in the tournament, and not achieving long-term content-based improvements (Rau and Contreras 2009). Similar evidence has emerged from a teacher pay-incentive programme introduced in Kenyan primary schools. As in the Chilean case, it was found that the gains in test scores were the result of teachers' short-term opportunistic behaviour to secure the pay reward (Glewwe et al. 2010).

Other similar interventions reported more positive results but just after they were combined with monitoring and enforcement devices. In India, for example, Duflo et al. (2012b) found positive test score effects which were the result of both pay-incentives and increased monitoring on teachers' attendance. Also in India, Kingdon and Teal (2007) found that pay incentives raised student achievement test scores only in private schools. The results appeared to be associated with the nature of contractual arrangements of Indian public schools, where teachers enjoy, unlike in private schools, permanent contracts that diminish the potential effect of pay incentives. Muralidharan and Sundararaman (2011) also found that both individual and group pay incentives raised test scores, although individual incentives were more effective, with spillovers effects having an impact on test scores in non-incentive subjects. This indicates that complementary policies such as attendance monitoring, sanction enforcement, and contractual characteristics may influence the effectiveness of pay incentives to improve education quality and learning.

Demand-side incentives

Demand-side behavioural incentives have been found to achieve positive impacts on school learning in Sub-Saharan Africa countries, although with some caveats. A Kenyan merit-based scholarship programme, which awarded primary school girls with funds to progress to secondary school, was not only effective in improving student performance but also generated positive spillover effects among boys (Kremer et al. 2009). Other studies have revealed specific factors that enhance or limit the effectiveness of such policies. For example, Nguyen (2008) found that a cost effective way to increase test scores in Madagascar was to provide students and their parents with statistics on returns to investment in education. Provision of role models was, however, only effective at improving poor students' performance when the role model was herself from a poor background. Das et al. (2004) found in Zambia that test score gains were only produced by cash transfers which were unanticipated by households. The result was associated with the fact that anticipated grants generated resource substitution and re-distribution effects, which meant that a share of the resources were taken away from students who obtained the grant and were re-allocated for other intra-household purposes. Related to this finding, was the study conducted by Baird et al. (2010) among secondary school girls in Malawi, which found that conditional cash transfers were more effective than unconditional cash transfers in improving student achievement test scores. The results stressed the role of conditionalities in influencing household inter-temporal preferences and decisions that affected the utilization of education services.

Supply-side plus demand-side incentives

We also identified policies that combine supply-side capability interventions with behavioural incentives. Examples of this type of policies are vouchers programmes, which has been extensively implemented in Latin America. Voucher programmes offer, on the one hand, monetary incentives for poor students to attend private schools that often have better records of teaching performance, and on the other hand, provide schools with the necessary resources to cover the increased demand for education services.

Angrist et al. (2002) and Angrist et al. (2006) report positive impacts of the Colombian school voucher programme (PACES) implemented in secondary schools. The renewal of grants is conditional upon satisfactory students' performance. Evidence suggests that the programme raised test scores both in the short term (Angrist et al. 2001) as well as in the longer term (Angrist et al. 2006; Barrera-Osorio 2007). In Chile, a similar voucher programme was analysed by Contreras (2001), Hsieh and Urquiola (2003), and Anand et al. (2009). The evidence on this case was; however, inconclusive. While Contreras (2001) finds a positive impact of the programme, Hsieh and Urquiola (2003) report a decrease in maths test scores. Following the decision of some Chilean private schools to charge a fee on top of the government voucher, Anand et al. (2009) analysed the test score impact of granting low-income students scholarships to attend those schools. They found that, while students awarded scholarships performed better than the ones in public schools, no difference existed between the performance of scholarship-funded students and that of students attending free private voucher schools.

The study carried out in Mexico by Behrman et al. (2012) implemented a three component intervention, where pay incentives were given to students only, to teachers only or both, and also to schools' administrative staff. The first two treatments rewarded individual performance whereas the third was designed to elicit collaboration through group performance. The policy was designed to impact multiple levels of the education system. While incentives to student-only was marginally effective in improving student learning achievements, (the intervention suffered from extensive cheating on part of the students), the teacher-only pay incentives were mostly ineffective. The biggest impact was, however, that of the combined incentive scheme which rewarded not only individual performance but also increased performance of groups. While, the authors reported cheating adjusted estimates to account for such a bias; the study brings to the fore the importance of carefully assessing the likelihood and impact of such behavioural patterns when examining performance-related reward schemes.

4.3 Participatory and community management interventions

Participatory and community management interventions involve bottom-up and top-down policies which, by diffusing knowledge among local communities, parent-teacher associations, and parent committees, raise awareness, and increase participation and involvement in the management of education systems. Examples of bottom-up policy strategies are the EDUCO community involvement scheme in El Salvador, analysed in Jimenez and Sawada (1999), and the PROHECO participation initiative in Honduras, analysed in Di Gropello and Marshall (2004). Both interventions resulted in improved student achievement test scores.

Top-down approaches are more commonly implemented by government education agencies to improve the management and operational inefficiencies of education systems. Examples of these policies are the Nicaraguan and Argentinian decentralization reforms analysed in King and Ozler (2005) and Galiani et al. (2008), respectively; the multi-level decentralization programme in Madagascar analysed in Lassibille et al. (2010), and the Chilean programme that transfer low-

income students to schools that reported the best management standards of practice (Palomer and Paredes 2010). These studies report mixed results. Whereas Palomer and Paredes (2010) found positive test score gains for the students that were allocated to better-managed schools, Galiani et al., (2008) found that test score gains that resulted from an Argentinian decentralization reform, failed to reach the poorest students (Galiani et al. 2008). Autonomy in decision-making at school level following a decentralization reform in Nicaragua could not explain the increases in test scores either, but just the de facto autonomous management practices (King and Ozler 2005). Similarly, the study by Lassibille et al. (2010) in Madagascar did not find any significant impact of decentralization on exam scores.

5 Conclusions

This study has reviewed the available evidence on education policy to identify what work to improve the quality of student learning in developing countries. The review has focused on experimental and quasi-experimental studies of policies that have been funded with either foreign aid or national governments alone or with the support of donors. We have identified three drivers of change that improve under certain conditions student achievement performance and learning. The first driver of change is found to be related to supply-side considerations of education systems, through the provision of additional material and human resources. The second driver of change is associated with demand-side considerations that deal with behaviour and intertemporal preferences of students and households. The third driver of change refers to bottom-up and top-down participatory and community management strategies, including decentralization reforms and community involvement in the school management.

The evidence reviewed suggests that interventions are more successful when two or more drivers of change are combined. Often, the mere provision of physical and human resources is ineffective in improving education quality, as unattended demand-related factors can undermine the full utilization of education services. Therefore, idiosyncrasies, social norms, and intertemporal preferences need to be factored in when designing education policies. Whenever demand for education is generated via community involvement or behavioural incentive programmes, the review of evidence suggests that it is crucial to upgrade simultaneously the infrastructure and administrative capabilities of education systems, in order to accommodate the increased demand without undermining quality. The growing literature on education policy based on experimental and quasi-experimental methods has helped us to better understand the underlying mechanisms at play in effective policy implementation. However, more work is still needed to examine the costs and social benefits of these policies to provide a more informed discussion for future post-2015 education policy strategies.

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Appendix

Appendix Table A1. Synthesis of evidence

Study	Setting	Funding	Study design	Study size	Intervention	Policy outcome
<i>Supply-side capability interventions</i>						
Paqueo and Lopez-Acevedo (2003)	Mexico (urban and rural); Primary (grade 6)	Government	RCT	897 (indigenous) 1024 (rural) 1480 (urban) 1921 (pooled rural-indigenous)	Supply-side education programme (PARE) aiming to reduce inequality and improve quality of primary education in four poorest Mexican states	a) Rural sector: test scores in Spanish improved for all, but more so for less poor students. When pooling indigenous and rural samples, poorest students' scores increase by only half that of less poor students overall b) Urban sector: inconclusive results due to experimental implementation problems
Barrera-Osorio (2007)	Colombia (urban); Secondary (grade 10)	Foreign Aid and Government	Quasi-experimental analysis(propensity score matching)	37,300	'Concession Schools' programme (publicly subsidized private schools)	Maths and reading scores increased by 2.4% and 4%, respectively
Barrera-Osorio and Linden (2009)	Colombia (urban); Primary and Secondary (grade 3-9)	Government	RCT	5201	Integration of computers into language teaching in public schools	Small average treatment effect of about 0.11 SD About a third of the students only used computers for IT training rather than incorporating its use into routine language and maths classes
Bjorkmann (2004)	Uganda (nation-wide); Primary (grade 7)	Government	Quasi experimental analysis (D-i-D)	96 (districts)	Government funded per-student capitation grant	Test scores in treatment district which had more exposure to grant were 0.42 SD higher
Glewwe et al. (2004)	Kenya (urban and rural); Primary (grade 6-8)	Foreign Aid	RCT	141,698	Flip-chart provision in primary schools	Flip chart provision did not result in any significant increase in test scores

Vermeersch and Kremer (2004)	Kenya (rural); Pre-Primary	Foreign Aid	RCT	1326–1350	Subsidized school meals provision	Test scores increased by 0.40 SD only in schools with better trained teachers. No effect on cognitive abilities, suggesting gains not a nutritional effect but increased attendance incentives explain score gains
Glewwe et al. (2009)	Kenya (rural); Primary (grade 3-8)	Foreign Aid	RCT	7354 – 12663	Textbook provision	Textbooks did not increase average scores but only test scores of the strongest students. Weaker students could not read the books as English is most often their third language
Evans et al. (2009)	Kenya (rural); Primary (grade 1-4)	Foreign Aid	RCT	582	School uniforms provision	Students' test scores increase on average by 0.25 SD
Duflo et al. (2012a)	Kenya (rural); Primary (grade 1)	Foreign Aid	RCT	6531	Extra contract teacher hired by parent-teacher associations (and reduced class size)	Test scores only increased for children assigned to new contract teacher. For the remaining children in consequently reduced (by half) classes, no gains take place
Burde and Linden (2012)	Afghanistan (rural); Primary (grade 1-8)	Foreign Aid	RCT, complemented by IVs estimation	1374	Effect of village-based community-schools provision on test scores and (indirectly) effect of reducing distance to school on test scores	Attending village-based schools raises test scores by 0.51 SD overall (with stronger impact on girls and on children who would not attend village-based schools without treatment). Reducing school distance by 1 mile improves scores by 0.15 SD (boys) to 0.24 SD (girls).
Asadullah (2005)	Bangladesh (nation-wide); Secondary (grade 11)	Government	Quasi-experimental analysis(regression discontinuity design)	2165	Effect of class size reduction (following discontinuous rule) on student test scores	Smaller class size does not affect test scores, possibly due to secondary school students being less sensitive to this. Or because class size only matters when coupled with adequate infrastructure and teacher quality

Banerjee et al. (2007)	India (urban); Primary (grade 3-4)	Foreign Aid	RCT	a) 21,936 b) 5523	a) Remedial education in basic literacy and numeracy skills b) Computer assisted Learning targeting maths skills	a) Average test scores increased by 0.28sd, result driven by lowest performing children b) Maths test scores increased by 0.47 SD
Linden (2008)	India (urban and rural); Primary (grade 2-3)	Foreign Aid	RCT	524 (in school experiment) 1114 (out of school experiment)	Computer Assisted Learning, as substitute (in school experiment) or complement for teacher (out of school experiment)	CAL lowered maths scores by 0.57 SD when implemented as a substitute for teachers, but improved them by 0.28 SD when used as a complement (the result is driven by weaker students, whose scores increase by 0.40 SD)
He et al. (2008)	India (urban and rural); Primary (grade 1-5)	Foreign Aid	RCT	48825327	New teaching methods (PicTalk computer machine and flashcard games) to improve teaching of foreign language (English)	Scores are raised by 0.25-0.35 SD by both games and computer-assisted learning. When students' own teachers delivered the interventions, positive spillover raised maths scores too and weaker students benefited the most. Stronger students benefited more from the self-paced computer assisted learning method
He et al. (2009)	India (urban); Pre-primary and primary (grade 1)	Foreign Aid	RCT	1267–2824	Literacy skills school programme (three types: in school, out of school, and pre-school)	Pre-school and out of school interventions generated higher gains (0.55 SD and 0.70 SD, respectively) compared to the in-school setting. Highest gains where for ex ante lowest performing students
Muralidharan and Sundararaman (2010)	India (rural); Primary (grade 1-5)	Foreign Aid	RCT	48791	Provision of low cost diagnostic feedback to teachers on students' performance	A supply-side intervention to provide feedback diagnostic was not enough to generate teacher incentives to improve students' exam scores (companion paper shows that coupled with pay incentives diagnostic feedback provides valuable input)

Muralidharan and Sundararaman (2011) *	India (rural); Primary (grade 1-5)	Foreign Aid	RCT	12,255–14,797 (maths) 12,410–14,963 (language)	Provision of an extra contract teacher and extra schooling materials	Provision of extra resources raised test scores by 0.10 SD on average, which is 0.13 SD lower than the average increase in test scores caused by the pay incentive scheme
<i>Incentives for changing preferences and behaviours</i>						
Angrist et al. (2001)	Colombia (urban); Secondary (grade 6-8)	Foreign Aid and Government	RCT	282	PACES vouchers funding low income students' private secondary education (grant renewal conditional on students' performance)	Lottery winners scored on average 0.20 SD higher on standardized tests. With larger disaggregated effects for girls than boys.
Angrist et al. (2006)	Colombia (nation-wide); Secondary (grade 10)	Foreign Aid and Government	Natural experiment (censored Tobit, non-parametric bounds)	3541	PACES vouchers funding low income students' private education (grant renewal conditional on performance)	Maths and Reading scores increased by 0.20 SD. Positive effects go beyond the incentive not to fail tests, gains are also reflected in increased school choice incentives
Contreras (2001)	Chile (nation-wide); Secondary (grade 10)	Government	Quasi-experimental analysis (two stage least squares)	56,200 (male) 62,900 (female)	School Voucher System (publicly subsidized private schools)	Average (language-maths) increase of 102 test points for male and 86 test points for female students
Hsieh and Urquiola (2003)	Chile (nation-wide); Primary and Secondary (grade 4 and 8)	Government	Cross-sectional and IV Analysis	84 (schools)	Government voucher scheme allowing any student wishing to do so to move from a public to a private school	The reform did not translate in positive achievement gains: maths test scores decreased. The only tangible result has been a middle class exodus from public schools
Anand et al. (2009)	Chile (urban); Primary (grade 4)	Government	Quasi-experimental analysis(propensity score matching)	14,036	Scholarship provision to low income students attending private voucher school which charge fees on top of the voucher	Low income students attending fee-charging private schools thanks to a scholarship score 0.20 SD higher than those attending public schools, but score no higher than low income students attending free private voucher schools
Rau and Contreras (2009)	Chile (nation-wide); Primary and Secondary (grade 4, 8, 10)	Government	Quasi-experimental analysis(regression discontinuity design and D-i-D matching)	955–1740	Teacher pay incentives to raise test scores (assessment of tournament competition vs 'gift-exchange' effect)	Competing in a tournament for pay incentive assignment raised test scores. But after winning, teachers do not act upon reception of the bonus in a way that maintains the score gains (e.g. out of gratitude)

Behrman et al. (2012)	Mexico (nation-wide, mostly rural); Upper Secondary (grade 10-12)	Government	RCT	11,300–17,800	ALI: Individual student and teacher pay incentive schemes; and combined incentive scheme to students, teachers and school administrative staff for both individual and group performance improvement.	Teacher incentive pay scheme were not effective on their own, while student pay incentive scheme were (0.2-0.3 SD gain). The biggest impact was, however, that of the combined incentive scheme which rewarded not only individual performance but also increased performance of groups (0.3-0.6 SD gain). Estimates are adjusted as cheating proved to be substantial.
Das et al. (2004)	Zambia (urban and rural); Primary (grade 5-6)	Government	Natural experiment and IV analysis	164 (schools)	Anticipated vs unanticipated cash transfers for school attendance	Maths and language test scores increase more when cash transfers are unanticipated by households. This is because anticipated grants lead to substitution effect of resources
Nguyen (2008)	Madagascar (rural); Primary (grade 4)	Foreign Aid and Government	RCT	11,659 (students)	Provision of statistic information on education earning returns and/or role models	Providing statistics raises scores by 0.20 SD on average, with an impact as high as 0.37 SD for students underestimating returns prior to RCT. Role models only increased scores when of low-income background (0.17 SD); with a higher impact on poorer students (0.27 SD)
Kremer et al. (2009)	Kenya (rural); Primary (grade 5-6)	Foreign Aid	RCT	1153–3602 (pooled sample) 768–2106 (Busia) 385–1496 (Teso)	Merit based scholarship award to fund secondary school progression for girls	Girls' test score increased by between 0.20-0.30 SD in Busia district. There is inconclusive evidence with regards to Teso. The impact also had spillover effects on boys' score increases and on test scores of girls who were not awarded the scholarship.
Glewwe et al. (2010)	Kenya (rural); Primary (grade 4-8)	Foreign Aid	RCT	15,641	Teacher pay incentive scheme tied to students' performance in exams	Test scores increased ad-hoc to achieve pay rise (ability to answer MCQs and filling the gaps questions). Thus, only test taking skills improved but no impact on content learning

Baird et al. (2010)	Malawi (urban and rural); Secondary (grade5-8)	Foreign Aid	RCT	2057	Conditional vs Unconditional Cash Transfer Schemes	Test scores are 0.14 SD higher in English, 0.12 SD higher in maths and 0.17 SD higher in overall cognitive abilities for girls who received the conditional cash transfer
Kingdon and Teal (2007)	India (urban); Secondary (grade 8)	Government	Cross-sectional and quasi-experimental analysis (IV)	360–542	Teacher pay incentive in private vs public schools	A 22% increase in test scores follows an increase in teacher pay from 1 SD below to 1 SD above the mean. This is only found in private schools, as a result of increased teacher effort (as public school contracts are mostly permanent in India, pay incentives do not generate effort increases in that context)
Duflo et al. (2012b)	India (rural); Informal learning centres (primary)	Foreign Aid	RCT	1760–1893	Teacher pay incentive and monitoring scheme to reduce absenteeism	A year after the intervention test scores were 0.17 SD higher. Gains are the results of both incentives and increased monitoring
Muralidharan and Sundararaman (2011)*	India (rural); Primary (grade 1-5)	Foreign Aid	RCT	12,255–14,797 (maths) 12,410–14,963 (language)	Individual teacher pay incentive scheme and group teacher pay incentive scheme (school-level)	The individual incentive scheme improved test scores by 0.27 SD in maths and 0.17 SD in language. The group scheme increased scores by 0.22 SD in maths and 0.09 SD in language. Spillovers raised scores in non-incentive subjects too (from 0.11 to 0.18 SD).
<i>Participatory and community management interventions</i>						
Jimenez and Sawada (1999)	El Salvador (rural); Primary (grade 3)	Foreign Aid and Government	Quasi-experimental analysis (structural equation modelling and IV)	605	EDUCO's Community Involvement and Decentralization Programme	Language test scores increase as a result of the decentralization and increased community involvement
Palomer and Paredes (2010)	Chile (urban); Primary (grade 4)	Government	Quasi-experimental analysis(propensity score matching and structural equation modelling)	225,206 (structural equation) 546(PSM)	Low income students' attendance of private subsidized SIP schools which implement best practice and management standards	Maths test scores increase by about 32 points in SIP schools as a result of good management practices

Di Gropello and Marshall (2004)	Honduras (rural); Primary (grade 3)	Government	Quasi-experimental analysis (structural equation model)	975	Community school participation programme (PROHECO)	10% point average increase in the percentage of correct answers for Spanish, maths and science exams
King and Ozler (2005)	Nicaragua (nation-wide); Primary and Secondary (grade 4 and 10)	Government	Cross-sectional and IV Analysis	945 (primary) 911 (secondary)	Decentralization of school-management reform	While official autonomy as a status does not improve learning, when <i>de facto</i> autonomous practices are considered, an increase in maths test scores is recorded
Galiani et al. (2008)	Argentina (nation-wide); Secondary (grade 10)	Government	Quasi-experimental analysis (D-i-D)	3273	Decentralization of secondary school system	Test score increased by 3.5% for maths and 5.4% in language, but the gains did not reach the poorest students
Lassibille et al. (2010)	Madagascar (urban and rural); Primary (grade 3-5)	Government	RCT	22,000	Improvement of school management practices at various levels of decentralization	Management practices were improved only when the intervention was implemented at all decentralization levels (that is, when school level implementation complemented district and sub-district implementation), but the impact on test scores was insignificant

Note:* The study by Muralidharan and Sundararaman (2011) is recorded twice in order to separate the resource provision from the behavioural incentive component of the intervention

Source: Authors' compilation.