Proposed Interventions for Modelling Formal Education

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This working paper presents the background to the identification of the proposed interventions for modelling formal education. Firstly, it outlines a number of meta-analyses and narrative reviews of interventions which establishes a conceptual framework for consideration of the education interventions. Secondly, it summarises the results of a thorough literature review of to determine the education interventions relevant to the Syrian context.[1]

1 Introduction

The key problem we seek to resolve is the formulation of the maximum-return education investment package to mitigate economic, social and psychological risks from non-investment in education, based on investments made in:

1. Primary and secondary education services for children adolescents.
2. Non-formal education for out-of-school adolescents and young people.
3. Mental health, wellbeing, and protection against violence (e.g. child labour, early marriage, violence in schools).
4. Participation in civic and social platforms for young people in terms of strengthening social responsibility and national solidarity. (UNICEF Syria Request for Proposal 2019)

In order to estimate the education outcomes in these areas, we need to identify and select a set of interventions most appropriate to each of these areas. From previous experience in the global adolescent study (Sheehan et al. 2017) and country studies for India and Burundi (Anup et al. 2019; Rasmussen, Sheehan et al. 2019), we have derived a set of education interventions, based on global and country evidence, which have been used in our modelling. These need to be verified and assessed for their applicability to the Syrian context.

The identified interventions tested in the modelling include: the renovation and reconstruction of the education infrastructure, which was both badly damaged and repurposed during the crisis; the training of new teachers and retraining of existing teachers; and the development of accelerated and alternative pathways to attract students back to school, including those returning from refugee camps in neighbouring countries. Interventions are needed to increase the quality of education, including vocational education to improve the chances of post-school employment. Informal education, such as life skills is required to complement formal knowledge and skills acquired in formal education.

Having identified the interventions, they are inserted into the education model to determine the most effective interventions to achieve the desired recovery path, as measured by estimated education outcomes, including increased enrolments, years at school and secondary completions.

In modelling the recovery path of the education system, we developed appropriate and realistic recovery scenarios. Modelling these scenarios will be affected by differentially phasing in the interventions. For instance, it might be that interventions which are concerned with the renovation and reconstruction of the education infrastructure will precede the implementation of re-enrolment incentives. There are also significant regional differences in both physical infrastructure and teaching capacity following the conflict. Some areas are already functioning reasonably well, while in others the education system is seriously degraded. We considered if these differences could be reflected in the model development.

[1] This working paper supports the VISES 2022 report to UNICEF Syria on the estimation of the cost of not investing in Syria (Rasmussen et al. 2022).

The purpose of this paper is to discuss the derivation of the formal education interventions which we believe are most relevant to the Syrian context, and for which there is sufficient data to include them in the modelling process. As discussed in the VISES report to UNICEF Syria (Rasmussen et al. 2022), vocational and non-formal educational interventions are modelled but there is little data on their effectiveness, and instead the outcomes of various scenarios are estimated.

2 Modelling formal education

The VISES education model (VEMM) for Syria was based on earlier versions developed initially for a large multi-country study, and which was refined to accommodate two country studies (for India (Anup et al. 2019) and most recently Burundi (Rasmussen, Sheehan et al. 2019)).

The modelled interventions were selected for their effectiveness in reducing dropouts, increasing enrolment and improving the quality of education. Interventions included: having schools within accessible distance; teacher quality; well-developed pedagogical methods and materials; remedial teaching; financial support; and some health interventions. In addition, there are interventions that are specific to adolescent girls such as adequate sanitary facilities, and programs and incentives to reduce child marriage (Rasmussen, Maharaj et al. 2019). Specific interventions included computer-assisted learning, cash transfers conditional on continuing attendance and more information to parents.

These interventions and the data on which they are based was largely sourced from Wils et al. (2019). The source of their intervention effectiveness data is largely two meta-analyses undertaken by Conn (2014) and Snilstveit et al. (2016). Both have undertaken reviews of the global education intervention literature of studies in developing countries to assess the effectiveness of the interventions reducing dropout rates and closing learning gaps.

Since these reviews were done, a number of further studies and two relevant reviews have been undertaken. One of these reviews has been a meta-analysis of education policies and programmes in developing countries conducted by Damon et al. (2019), which includes new intervention effectiveness measures in standard deviations (SD). There has also been a review of earlier systematic reviews by Evans and Popova (2015) of the World Bank, focussed on programs to improve learning, but not necessarily including enrolment or retention for Sub-Saharan Africa.

3 Evans and Popova review

The Evans and Popova paper (2015) is helpful, not only because it reaches conclusions about the classes of effective interventions based on its review of reviews, but also for its useful critique of the approaches adopted by the reviews.

Of the six reviews considered by Evans and Popova:

- three are meta-analyses – Conn (2014), McEwan (2014), and Krishnaratneet al. (2013);
- two are narrative reviews – Kremer et al. (2013), and Murnane and Ganimian (2014); and
- one is a vote count – Glewwe et al. (2014).

Several of the reviews have elements that cross categories. Kremer et al. (2013), while it is a narrative review, it does present standardized coefficients, and Conn (2014) presents the results of a meta-analysis but also includes a narrative discussion (Evans and Popova, 2015, pp. 5–6).

In addition to the complication of their different approaches, comparisons of the reviews are made difficult by different composition and categorization of interventions. For instance, one study included in all six reviews (a study of merit-based scholarships for students) is categorized in four reviews as student incentives or merit scholarships, whereas two reviews categorize it as school fees or cash transfers. Interventions involving computer-assisted learning were variously classified as pedagogical interventions (Conn 2014), or as computers or instructional learning (McEwan 2014).

Despite these issues, Evans and Popova (2015) settled on three clusters of interventions which were effective, as listed below.

1. **Pedagogical interventions that match teaching to students' learning are found to be the most effective of interventions to raise student learning.** These fall into two groups: (a) computer-assisted learning (CAL) programs which adapt to the student's learning level, or (b) teacher-led methods that emphasize formative assessment and individualized and targeted instruction. McEwan (2014) finds computer-assisted learning programs to have a greater impact than other kinds of interventions, with a mean effect size of 0.15 (significant with 99% confidence). A CAL program in India increased math scores by 0.48 SDs (Banerjee et al. 2007). CAL programs need to be tailored to student needs. Those that don't, tend to be ineffective.
2. **Individualized, repeated teacher training, associated with a specific method or task.** McEwan (2014) finds teacher training to produce a 0.12 SD improvement in learning (significant with 99% confidence). One-time in-service trainings at a central location are not found to be highly effective.
3. **Accountability-boosting interventions include employing contract teachers and paying performance incentives.** On average, McEwan (2014) finds the effect of performance incentives to be 0.09 SDs at 95% confidence on learning. Contract teachers (0.10 SDs) have lower absenteeism.

4 Damon, Glewwe et al. 2019 review

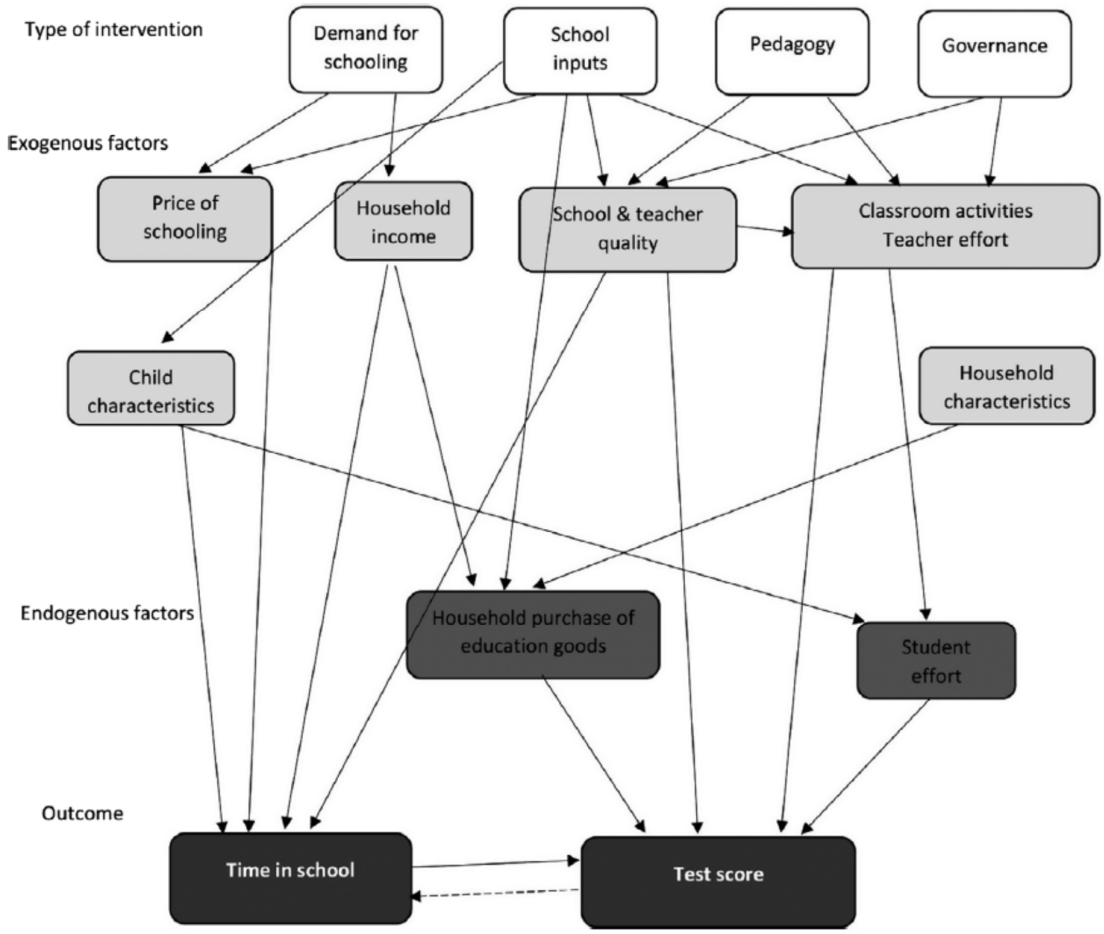
Damon et al. (2019) focus on two questions:

1. What education policies increase students' time spent in school, measured in terms of student enrolment, attendance and completed years of schooling?

2. What education policies and programmes lead to increases in student learning?

Damon et al. surveyed 28 reviews of which eight were meta-analyses. The conceptual framework is illustrated in Figure 1.

Figure 1 Conceptual framework



Source: Damon et al. (2019, p. 300).

The approach focusses on four types of intervention:

- demand for schooling;
- school inputs;
- pedagogy; and
- governance.

These four types of interventions are acting on four intermediate variables:

- price of schooling;
- household income;
- school and teacher quality; and
- classroom activities and teacher effort.

These variables affect the outcomes *Time in school* and *Test score* (see Figure 1).

The 2019 approach adopted in assembling the analysis of the literature, addressed many of the criticisms made by Evans and Popova (2015) in comparing interventions of different effectiveness

and significance. It introduces a weighting system that includes number of interventions, significance and sample size.

The interventions were clustered under two principal areas as illustrated in Figure 1, as follows.

1. Interventions that increase time in school.
2. Interventions that improve learning outcomes.

The most consistently positive interventions that increased time in school were building additional schools, conditional cash transfers (CCTs) and merit-based scholarships. The construction of new schools was the key input intervention, while CCTs and merit-based scholarships acted to increase demand for schooling. An intervention program in need of further evidence, but producing large and significant results particularly for girls, is the provision of bicycles to travel to secondary school.

The provision of vouchers to attend private schools and school feeding programs tended to be more context-specific, but produced large increases in time at school in some studies.

Interventions that improved learning outcomes with the highest effectiveness included those discussed above, CCT programs, merit-based scholarships and building new schools. Remedial programs and teaching to the right level were also highly effective in increasing learning scores, and particularly effective if sustained over two years.

Other programs that produced large but more variable results, included the provision of computers/ICT/ electronic games, for computer-assisted learning. Computer-assisted remedial maths programs produced more consistently favourable outcomes. Performance pay or other teacher incentives were also generally successful, but more context specific. Those that encouraged greater supervision of teacher attendance performance and contract renewal had a significant effect on student test scores (Duflo et al. 2015).

5 Proposed formal education interventions of Syria

Based on the literature identified in the Damon et al. (2019) review, we conducted our own meta-analysis of 268 papers to identify relevant interventions for Syria, their effectiveness and cost. We adopted the classification system used by Damon et al. (2019) to divide the interventions into those that work, often work, are promising but need of more evidence, and more likely not to work. Studies were classified into these divisions based on criteria regarding the number of studies of the particular intervention, the statistical significance of the results and some consideration of the likely success of the intervention's application in a local context. Those classified as often, but not always working, tended to depend for their success on their appropriateness to the local context.

As illustrated in Figure 1, Damon et al. (2019) also classify the types of intervention according to whether their effect is through demand for education, increases in resources for schooling (inputs), improvements in pedagogy or governance.

Finally, Damon et al. (2019) distinguish between the educational outcomes, which increase time at school (enrolment and reduced dropout), and improved learning, as measured by test scores (see Table 1).

Table 1 Effectiveness and cost of selected education interventions

	Average effectiveness			Average $/student		
	Learning/ Test scores	**Enrolment**	**Dropout**	**Learning/ Test scores**	**Enrolment**	**Dropout**
Interventions that works						
Conditional cash transfers	18.3%	25.8%	10.3%	$131	$263	$136
Merit-based scholarship	33.1%	13.8%		$39	$26	
New schools	56.8%	45.3%		$50	$50	
Remedial education	37.2%			$32		
Interventions that often works						
Teacher incentives/ performance pay	27.9%			$2		
School meals			36.9%			$36
Private schools (vouchers)	23.5%	24.8%		$501	$64	
Computers / ICT	31.2%			$128		
Interventions that are promising, require more evidence						
Bicycle provision		31.9% 52.3% (girls)			$48	
Interventions that are more likely not to work						
School-based management		1.1%	2.4%		$2	$2

Source: VISES estimates based on Damon et al. (2019).

5.1 Interventions that work

The evidence strongly supports the effects on education outcomes of **conditional cash transfers**. Damon et al. (2019) reports 52 of 57 estimates for 24 randomized controlled trials or other high quality studies as being positive and statistically significant. The PROGRESA scheme in Mexico is one of the best known. Other programs have become common in Latin America and increasingly so in Asia and Africa. While the scheme details differ, conditional cash transfers provide financial support to students to remain at school. While some are provided as a final year lump sum, others provide ongoing support contingent on daily attendance over the school year. Of the selected interventions, CCT alone has a favourable impact on each outcome, test scores, enrolment and reduced dropout. The highest average impact across the study results was 26% for enrolments and 18% for test scores.

Merit-based scholarships both increase student time at school and particularly their test scores. These are generally administered as competitive-based rewards to meet future costs of schooling. Our results are based on three studies (Kremer et al. 2009; Friedman et al. 2011; Blimpo 2014) which found positive and significant effects on test scores and enrolment. Blimpo (2014) found similar results equivalent to improvement in test scores of between 35% and 40% for individual, team and tournament-based merit scholarships. Most studies conducted to date in developing countries have been in Sub-Saharan Africa. The average cost of the scholarship per student was about $39.

Although the number of studies of the impact of **new school construction programs** are surprisingly few in number (Duflo 2001; Handa 2002; Alderman et al. 2003), they are of high quality and indicate a very high response to the availability of nearby school facilities. Our analysis indicates an average across the studies of an increase in enrolment of 45% and in test scores of 57%. Those that include girl-friendly facilities have been shown to be particularly successful (Alderman et al. 2003). The

studies have been undertaken in a range of developing countries, such as Indonesia, Mozambique and Pakistan.

Remedial education or teaching at the right level has been shown to be very successful at raising test scores. Three high quality Indian studies (Banerjee et al. 2007; Banerjee et al. 2010; Lakshminarayana et al. 2013) recorded an overall average increase of 37%. The programs have been generally conducted at school premises but after school, by specially trained and recruited volunteers at an average cost of about $32 per student.

5.2 Interventions that often work

Performance pay or other teacher incentives has had mixed success, but in two out of three studies these have been found to be effective in increasing test scores by an average of 28%, in India (Muralidharan and Sundararaman 2011), and in Chile (Contreras and Rau 2012). A study in Kenya suggested the effects were not long lasting (Glewwe et al. 2010).

We reviewed nine studies evaluating the impact of **computers and ICT-assisted learning** programs on learning which produced eleven results, not all of which had significant outcomes. Particularly, the results for the impact on enrolment were not significant. We focussed on three studies conducted in India by Banerjee et al. (2007) and Linden (2008), and in China by Mo et al. (2013, 2014) which generated seven study results. These were essentially remedial mathematics programs and were highly effective at the end of one year, with an increase in test scores of an average 31% across seven study results, at an average cost of $128 per student. The Banerjee et al. (2007) study recorded the largest gain, equivalent to an 86% improvement in test scores after one year, but which faded to 18%, one year after the program ended, illustrating the need for ongoing programs.

For **school meals programs,** we reviewed six papers providing 14 sets of results on the impact of time in school and test scores. The impact on time in school for most of the studies was a small positive or negative. Few of the results were significant. However, for the impact on the test score, five of the seven studies were positive, of which four were significant. The average impact was 28% at a cost per student of $36. These were studies conducted in very different countries – Argentina, Philippines, and Burkina Faso – indicating that the intervention may be applicable to a wide range of conditions.

Vouchers to attend private schools have been advocated to encourage students to attend school. In some cases, it is to attend a higher quality school than the government school more readily available. Studies of the PACES program in Colombia has indicated that students with the vouchers improved their performance. However, the scheme has biases which favour such an outcome. Those who fail to meet certain minimum standards lose their voucher (Angrist 2002, 2006). Other studies (Muralidharan and Sundararaman 2013; Lara et al. 2011) have not found any significantly positive result.

5.3 Intervention that are promising, but require more evidence

The **provision of bicycles to secondary students** to ride to school has received enthusiastic support from schools that have implemented it, particularly for increasing access to school for girls, who would otherwise need to walk long distances to school and be subject to harassment and other dangers. Parents therefore welcome the initiative as it shortens the journey to school and increase its safety. In a study by Muralidharan and Prakash (2013, 2017), the overall enrolment rate increased

by 5.2 percentage points or 32%. The enrolment rate for girls increased by nine percentage points from 17.2% or 52% at a cost of $48 per student. This may have application in rural areas of Syria.

5.4 Interventions that are more likely not to work

The other listed intervention programs have only small changes and/or results which are not significant. **School-based management** has been suggested by the World Bank (2019) as helping address problems with overly bureaucratic education administrative structures. However, the results of four studies identified by Damon et al. (2019) are small or not significant.

6 Education interventions for post-conflict zones

The interventions discussed above have been assessed in a range of social and economic contexts, but generally not in conflict or post-conflict zones. It is therefore useful to examine the evidence for those interventions that are most relevant to post-conflict environments.

One complication is that education is not a neutral factor in conflicts. Its nature, availability and delivery may itself play a role in the conflict (see Smith and Vaux 2003; Bush and Saltarelli 2000). The curriculum may be used to intensify differences, which amplify the conflict, and the conflict increases the likelihood of a biased curriculum. Inequitable access to education may also underlie the conflict, with some sections of the community, whether arising from ethnicity, religion, geography or income, being denied access to education (Burde et al. 2017; Omoeva et al. 2016; Omoeva and Buckner 2015).

The most important and practical interventions in conflict-affected settings are those designed to increase access to education. Without attendance, the interventions designed to increase the quality of education outcomes can have no role.

School infrastructure destroyed during the conflict and school personnel killed in the conflict need to be replaced (Cuaresma et al. 2012; Lai and Thyne 2007). In conflict affected Afghanistan, the construction of community-based schools, reducing substantially the distance to school, had a dramatic impact on enrolments, with girls benefitting most, where their enrolments rose from 27% to 70% (Burde and Linden 2013). In addition, girls' test scores increased by 0.25 SDs.

Girl-friendly schools also increase enrolments. In another study in Afghanistan, girls' enrolments rose by 30% as the proportion of female teachers rose (Guimbert et al. 2008).

As discussed in the VISES report to UNICEF Syria (Rasmussen et al. 2022, Chapter 3) on mental health issues, psychosocial therapy has been successful in raising enrolment, attendance and classroom performance for war-affected youth (Betancourt et al. 2014). This study also successfully used an education subsidy to increase enrolment, independently of the psychosocial therapy intervention. Structured, meaningful and creative activities in the school setting also improves wellbeing (Ager et al. 2011; Kostelny and Wessells 2008).

Evidence to support the adoption of some of the proposed interventions do not have a particular application in conflict-affected contexts, and yet it is likely that these would have relevance in the education recovery path in Syria. These include teacher training and remedial education programs.

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