ECONOMIC INPUT TO THE DESIGN OF THE DFID MALAWI EDUCATION PORTFOLIO

Final report

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Executive summary

The importance of the MESRP programme impact of improved learning outcomes manifested through enhanced quality education in Malawi lies at the centre of economic growth theory as well as education economics. Education economists treat expenditures on education as investment flows that build human capital, generating increased income and growth. Macroeconomists have demonstrated that sustainable long term growth in equilibrium can only be sustained though innovation and human capital accumulation putting education to the centre of most development strategies.

In order to evaluate the benefits of DFID's proposed SBS investment in Malawi's education sector, this EA has looked at the benefits of 2013/14 investment in each of 4 priority areas: teacher training, textbooks, school improvement grants, and school construction. The evaluation of benefits is based on findings from available research literature.

The cost benefit analysis starts from the cohort progression data that have been collected by MoEST in the course of modelling for ESIP II. Forecasts have been calculated using the most recent trends of repetition and drop-out rates. The effect of investment into each of the 4 priority areas was then compared with the base model.

In order to calculate the additional income for the learners affected by each investment, the starting point is figures from the World Bank data collected for Malawi in 2010. These figures include measures of 2008 earnings for each of 6 levels of education completed. They also include the public and private costs for each level of education. To these figures an estimate has been added for indirect benefits. The results have been analysed over the working life of learners applying DFID Malawi's discount factor of 10% per annum. Throughout the CBA, choice of assumptions has been cautious to remove any optimism bias.

Results have been calculated for each of the 4 investment areas and all provide substantial returns with benefits to cost ratios ranging from 2.97 up to 4.68 and internal rates of return from 15.5% up to 20.2%.

In conclusion, these results provide robust justification for Option 1 of the business case, which is a £14 million SBS investment in 2013/14.

The effects of the assumptions used have been sensitivity-tested and the positive results of Option 1 prove to be resilient to adverse scenarios tested.

On the other hand, it is noted that the education input mix determines quality education in conjunction with factors like incentive mechanisms, institutional set-up, school autonomy and accountability, political economy and management capacity in MoEST including change management skills. The sensitivity of such factors to learning outcomes are such that £14 million could be spent in 2013/14 on teacher training, textbooks, etc, with much smaller benefits than those predicted above. Conversely, aided by the influence of DFID at the SBS table, a more favourable environment on such areas could lead to much faster enhancement of education quality.

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Abbreviations

BC	Business case
BCR	Benefits to cost ratio
CBA	Cost benefit analysis
EA	Economic appraisal
EDUCO	Educación con Participación de la Comunidad
ESIP II	Second education sector implementation plan
E-SWAP	Education Sector Wide Approach
HMG	Her Majesty's Government
HTN	How to Note
IRR	Internal rate of return
KGIS	Keeping Girls in School
MESRP	Malawi Education Sector Reform Programme
MoEST	Ministry of Education Science and Technology
PASEC	Programme on the Analysis of Education Systems
PSIP	Primary Schools' Improvement Programme
RCT	Randomised Controlled Trial
SBS	Sector budget support
TOR	Terms of reference
TTC	Teacher Training College

1   Introduction

1.1   Background to this economic input

HEART (Health & Education Advice and Resource Team) is providing economic input to the design of the DFID Malawi education portfolio. This input is being provided by experts Nick Hall, a Malawi-based consultant specialising in public sector management, and Viola Dub, an ODI fellow who has been supporting MoEST. HEART has subcontracted DMA, for whom Nick and Viola work, to conduct this assignment.

According to the TOR (at Annex A), the purpose of the assignment is to provide the necessary economic input to the design of DFID's potential support to the education sector through its next programme, Strengthening Education in Malawi (SEIM). This will include a strong role in the design of the programme, and optimisation of instruments, economic appraisal of various options for achieving the objective, and a comprehensive assessment of value for money considerations.

1.2   Updates to the TOR

The following changes to the TOR have been adopted:

- No 3 of the TOR has been updated as the £50 million over 3 years has been reduced to £14 million over 1 year.

- No 6 of the TOR had stated that the Malawi Education Sector Reform Programme (MESRP) was due to end 30th June 2013 to be followed by a new programme. The BC now describes the one year investment as an extension to MERSP.

- No 11 of the TOR, setting out the Outputs has been updated by merging outputs (b) and (c) as one output, as agreed in dialogue with DFID Education Advisor.

1.3   Methodology

The methodology plan was set out in the Inception Report (16th May). The actual methodology has been as follows:

1.3.1   Document review

Relevant documents sourced from DFID and from MoEST (see Annex B) were reviewed.

In addition, in conjunction with DFID, relevant research documents were found from the internet, especially providing EA of inputs to education in comparable contexts (see References/Bibliography).

1.3.2   Approach to benefit evaluation and development of CBA model

The approach to be adopted for benefit evaluation was discussed with the DFID Education Advisor throughout the evolution of the BC.

In parallel with these discussions, the cost benefit analysis model (CBA) was developed. The chosen approach for the model was demonstrated on 6th June, with provisional findings.

1.3.3 EA report

The final EA report was delivered on 21st June

1.4 Coverage of this report compared with HTN

This report is set out referring to the DFID How to Note (HTN) on Economic Appraisals (February 2009). The following table describes how each of the 15 sections for economic appraisal reporting are dealt with in this report.

	Section in HTN	**How addressed in this report**
1	Rationale for intervention	These areas are already fully covered within the BC. Economic input on those parts of the BC has been given by the HEART experts, when appropriate.
2	Options considered for tackling the problems	
3	Intervention logic and evidence	
4	Incremental costs	
5	Incremental benefits	These areas are covered in this report
6	Balance of costs and benefits	
7	Risk and uncertainty	
8	Incidence of costs and benefits	These areas are already covered within the BC, where applicable. Economic input on those parts of the BC has been given by the HEART experts, when appropriate.
9	Competition assessment	
10	Macroeconomic impact	
11	Fiscal impact	
12	Financial sustainability	
13	Attribution to DFID	
14	Summary and recommendations	This is covered by the Executive Summary in this report
15	Technical note	This is covered in this report

1.5 Lay-out of this report

The rest of this report is laid-out as follows:

- Benefit evaluation and key assumptions
- Results and sensitivity analysis
- Annexes

2 Benefit evaluation and key assumptions

2.1 Background

The importance of the MESRP programme impact of improved learning outcomes manifested through enhanced quality education in Malawi lies at the centre of economic growth theory as well as education economics. Since Schulz in the 1960s, expenditures on education, whether by the state or households, have been treated as investment flows that build human capital (Schultz 1961), generating increased income and growth. Macroeconomists like Mankiw, Romer and Weil (1992) demonstrated in economic models that sustainable long term growth in equilibrium can only be sustained though innovation and human capital accumulation which shifted education to the centre of most development strategies.

Despite this shift in the sectors' importance through the recognition of the sectors' positive knock on effects to the productive parts of the economy, research finds that expansion of education *quantity* per se, i.e. the numbers attaining each level of education, cannot be translated into improved economic conditions, rather it is education *quality* measured through cognitive skills that drive individual earnings, the distribution of income and ultimately economic growth (Hanushek Woessmann 2007). Given that education quality is so poor in Malawi (e.g. the SACMEQ scores referred to in the BC), this paints a bleak picture since education quantity (for example those completing Standard 8) is already very low. The same authors find that in order to enhance education quality, increased resources per student - without major institutional changes, establishing an incentive mechanism for efficiency and high performance - have little effect.

It is against this background that DFID is supporting the implementation of Malawi's National Education Sector Plan through pooled sector budget support (SBS), striving to transform the education system through the provision of enhanced quality. As outlined in the BC, the channel of SBS enables DFID to support, advise and exert influence over the education sector in Malawi in a holistic manner, while supporting Malawi ownership.

Given the shift away from mere educational attainment measured in years of schooling towards education quality, manifested through cognitive skills most widely proxied by standardized test score results, the education production function which tries to establish a causal link between an education input mix and education quality increases moved into the limelight of research for policy guidance and evaluation. Overall research findings on the effect of increased inputs like physical education infrastructure, textbooks and increased number of teachers on learning are mixed, context specific and depend heavily on the educational framework in place as well as the available starting stock which points towards a minimum resource requirement (Hanushek 2007, Kremer 2003). Prominent researchers like Hanushek therefore conclude that it is not the education input mix that determines quality education but incentive mechanisms in the institutional setup leading to increased teacher motivation that matter. Choice and competition, school autonomy and accountability seem to have a direct link to quality increases in the same research.

Summing up economic research in general supports the argument brought forward in the rest of the business case, that support to the education sector merely in the form of discrete funding of certain inputs will not guarantee to yield improvements in the quality of education in Malawi (Hanuskek 2007). It is mainly the non financial cooperation under the sector support, striving to remove bottlenecks in the political economy and operational processes together with the MoEST, geared at increased autonomy and accountability at school level that will ensure that investments into the classical education inputs will yield return.

2.2 Approach to benefit evaluation

In order to evaluate the benefits of DFID's proposed SBS investment in Malawi's education sector, this EA has looked at the benefits of investment in each of 4 priority areas: teacher training, textbooks, school improvement grants, and school construction. These 4 areas correspond to the highest spending areas set out in the Eligible Expenditures annex of the Joint Financing Agreement of the Sector Wide Approach. The evaluation of benefits is based on findings from available research literature which is summarised below for each of the 4.

Despite of the overall finding in the research that input policies cannot always be translated into increased learning outcomes a more nuanced view needs be filtered out of the research which does not deny that some investments in inputs can be productive and that especially in a developing country context like Malawi "some minimal levels of key resources are frequently valuable in promoting students learning" (Hanushek 2007, p. 66).

2.2.1 Teacher training

Looking at the impact of the class size effect on learning outcomes, studies from Kenya (Duflo et al 2010) and India (Banerjee et al, 2005) suggest that a reduction in class size without a corresponding improvement in pedagogy will have little impact on learning. Nevertheless in the case of Malawi a recent study conducted in the course of the USAID programme of the "Malawi Teacher Professional Development Support" on the "Analysis of the Impact of Teacher Pre-Service Training Programs on Primary School Students' Performance" finds that for every additional 1% of teacher with 1 or more years of training repetitions falls by 0.19%. This result appears to have been achieved in Malawi because there have several parallel efforts already underway to improve levels of pedagogy as well as the general teaching style of primary school teachers in Malawi. Given these efforts and because this research is focused on Malawi, the cost benefit on teacher training draws on this particular research finding.

2.2.2 Textbooks

Textbooks are yet another education input, whose availability seems to have a bearing on test scores (Heynemann et al 1984, Harbison et al 1992). Evidence is mixed and points towards the fact that mere textbook provision is not a panacea but that quality and adaptability to local languages highly matters. Results from a randomized evaluation in Kenya (Glewwe et al 2009) paint a more subtle picture since provision of textbooks increased test scores by about 0.2 standard deviations, but only among students who had scored in the top one or two quintiles on pre-tests prior to the program. Textbook provision did not affect scores for the bottom 60% of students (Glewwe, et al., 2002b). However this result has to be taken with caution since many students may have failed to benefit from textbooks because they had difficulty understanding them. Kenyan textbooks are in English, the official language of instruction, but English is most pupils' third language, after their mother tongue and Swahili. Given the results with textbooks, researchers tried providing an alternative input, flip charts that presumably were more accessible to weak pupils. Retrospective data from the area suggest flip charts substantially improve test scores, but again, a randomized evaluation provides no evidence for this (Glewwe, et al., forthcoming).

A study from West Africa using standardized test score results from PASEC countries shows that "students in a class where each child has one textbook in both French and mathematics, score 6.6 to 8 percentage points higher than students in a class with no books. A difference of 8 percentage points corresponds to almost 18% of mean scores" (Michaelowa 2001, p.17). The CBA on investment in TLMs in Malawi, where there is a severe shortage of textbooks, is based on the

findings of the research from West Africa as the circumstances there most closely resemble those in Malawian.

2.2.3 School improvement grants

In Malawi primary schools have been receiving direct funding into school bank accounts under the Primary School Improvement Programme (PSIP) funded through the E-SWAP which decentralizes financial management and decision making to the school level. School Improvement Plans are being developed by the local education stakeholders covering access to education (50%), quality (40%) and governance (10%). Grants are being disbursed for the implementation of these plans. On theoretical grounds school based management is an ideal incentive mechanism since it motivates frontline service providers as well as the local community to be directly involved in decision making. De Gauwe (2004) establishes that school based management is democratic, more relevant to particular needs, less bureaucratic, enhances accountability and can lead to greater resource mobilization. Educational decentralisation is expected to stimulate improved education quality through:
   1. Increasing the quantity and quality of inputs.
   2. Increasing the relevance of programmes.
   3. Greater efficiency in the allocation and use of resources.
   4. Efficient use of local information through reduced transaction costs.
   5. Shifting the structure of accountability to local constituents.
   6. Benefits for both central and local governments through the redistribution of political power and burden-sharing.
   (Bruns et al., 2011)

Quantitative research measuring the effect of decentralization on education quality is scarce and focused on Latin-America. Bruns et al. (2011) comment that there are few rigorously evaluated school-based management programmes compared with the number of such reforms being carried out.

In Sub-Saharan Africa a recent study by Blimpo and Evance finds through a RCT that the interventions reduced student and teacher absenteeism in the Gambia but that it had no impact on learning outcomes. In an RCT in Kenya the effect of giving schools grants to employ additional teachers was tested. "Eighteen months into the program, students in all treatment schools had, on average, test scores that were a 0.23 standard deviation higher than students assigned to civil service teachers. Also, the scores were a 0.3 standard deviation higher than those of students in non-ETP schools" (Duflo et al 2007).

Latin America is richer in studies attempting to quantify the effect of different decentralization approaches on education quality. Results are mixed and no study reports a significant effect of decentralization on student test scores but the findings do suggest a direct effect of decentralization on dropout, repetition and other "indirect" quality measures. EDUCO schools in El Salvador are characterized by strong community involvement and have been studied extensively. Jimenez and Sawada (2003) found that the probability of continuing in school increased by 64 percent compared with attending a non-EDUCO school. King and Özler (1998) studied the effects of school autonomy in Nicaragua on student test scores in mathematics and Spanish and found that it did not have a statistically significant effect on achievement. Nevertheless the authors did find that autonomy has a positive effect on promotion rates. In Guatemala, after controlling for student, teacher and school factors, decentralized managed schools outperformed traditional schools in reading (Di Gropello 2006). Likewise for Nepal research has shown that devolving management responsibility to communities had a significant impact on certain schooling outcomes related to access and equity (Chaudhury and Parajuli 2010).

The cost benefit analysis of investment into school grants in Malawi is guided by research findings from Skoufias and Shapiro (2006) on the Mexican primary school quality programme. These particular research findings are most suitable for use in the Malawian context since the programme design is, of the reviewed literature, closest to the programme design and setup of the Malawian PSIP. It consists like in Malawi of a grant for the implementation of a school improvement plan for basic inputs and is based on strong community involvement. The findings are that participation in the school improvement programme decreased dropout rates by 0.24 points, failure rates by 0.24 points, and repetition rates by 0.31 points. In order to translate these findings into the Malawian context the size of the grant in each country was compared to the budget per school. The $3,000 per year grant in Mexico is 10% of Mexico's per-school primary budget (excluding salaries), which is close to Malawi's school improvement grants being 11% of non-salary primary budget.

2.2.4 School construction

Research finds that the return from investment into physical infrastructure is large if initial stock falls short of a minimum level required for learning (Glewwe et al 2003). Burde et al (2013) find a highly positive effect of school construction in rural Afghanistan on attendance and academic performance of learners. Girls' enrolment increases by 52 percentage points and their average test scores increase by 0.65 standard deviations. In the case of Ghana, Glewwe and Jacoby (1993) evaluate the indirect effects of improving school quality on student achievement through increased grade attainment. Their research finds that repairing classrooms is a very cost effective intervention in Ghana. Glewwe and Jacoby's regression analysis shows that the proportion of unusable classrooms is negatively associated with reading scores.

The most powerful study regarding the impact of a large scale infrastructure project is by Duflo (2001) who evaluates the school construction programme between 1973 and 1978 in Indonesia. She finds that each primary school constructed per 1,000 children led to an average increase of 0.12 to 0.19 years of education, as well as a 1.5 to 2.7 percent increase in wages. Under ESIP II in Malawi the government is going to construct an additional 1500 classrooms in the 2013-14 financial year which will add up to the construction of an additional 4,500 in the 5 year period between 2010 and 2015. The use of Duflo's research findings from Indonesia is most appropriate for the CBA on school construction since the project of the Indonesian Government increased the existing stock of education infrastructure similar to the intervention in Malawi. Other studies on the effect of increased infrastructure reviewed are based on maintenance or the construction of completely new schools in areas where there had previously been none. The latter scenarios are further away from the implementation reality of the Malawian infrastructure programme and have therefore not been considered in this EA. Apart from this Malawi's stock of classrooms is very low compared to the demand, which makes the use of Duflo's findings of investment returns into the construction of additional infrastructure even more appropriate.

2.3 CBA model

An education costing model developed by MoEST in the course of ESIP II, based on actual enrolment and other data up to 2012, is used as the starting point for the Cost Benefit Analysis (CBA) model. From these cohort figures, forecasts were calculated in that model, based on the most recent trend of repetition and drop-out rates. With this forecast, the numbers of learners each year completing each level of education were calculated in the CBA model. The 6 levels include: completion at any time before standard 8; completion of standard 8; completion of form 2; completion of form 4; subsequent completion of 2-3 year skills training (TEVET) or completion of 4-5 year university degree.

The effect on the cohort progression figures of an investment in one of the 4 priority areas was then compared with this base model. For example, the effect of a 2013 once-off investment in 600 primary teachers, corresponding to a 1% increase in the total number of teachers, was assumed to lead to a reduction in repetition by 0.19%, according to the research explained above. The effect of this was assumed to peak in 2015 and then decrease back to the norm steadily over the next three years with the effect decreasing as the new teachers are lost through attrition. The model showed the following changes in learners completing each of the 6 levels shown in the table below:

Extract from CBA model showing effect of 0.19% reduction in repetition over 2013-27.

Year	Additional/fewer completing stages each year						Cumulative over 44-year school/working life					
	<Std 8	Std 8	Form 2	Form 4	TEVET	Univ	<Std 8	Std 8	Form 2	Form 4	TEVET	Univ
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0
2016	505	-506	0	0	0	0	505	-506	0	0	0	0
2017	160	-299	0	0	0	0	665	-805	0	0	0	0
2018	116	-180	106	0	0	0	781	-985	106	0	0	0
2019	-15	13	96	0	0	0	766	-972	202	0	0	0
2020	-183	179	33	240	13	15	583	-793	235	240	13	15
2021	-202	204	6	391	14	16	381	-589	241	631	27	31
2022	-253	203	-16	360	12	13	128	-386	225	992	38	44
2023	-293	211	-5	276	8	10	-165	-175	220	1,267	46	54
2024	-261	93	9	168	4	5	-426	-82	229	1,435	51	59
2025	-182	-83	12	113	4	5	-608	-165	241	1,548	54	64
2026	-91	-205	-1	100	3	4	-699	-370	240	1,648	57	68
2027	-26	-242	-18	99	3	4	-725	-612	222	1,747	61	72

Explanation of the figures in this example:
- The effects are first seen in 2016 following the reduction in repetition from 2015, once the investment in 2013 leads to trained teachers two years later.
- This extract is cut-off at 2027, while the actual model continues until much later.
- The effect of the once-off investment reduces over the years. The reduction has a long tail as learners in standard 1 in the final year directly affected (2018) flow through the cohorts. The high rates of repetition in Malawi cause the effect flowing through the cohorts to continue to be felt for more than the minimum 8+4+4 years.
- The negative numbers at lower levels are attributable to the reduction in overall enrolment (created by the decrease in repetition) with promoters flowing through to the next level. Note there is no change in drop-out in this example.

The main beneficial effects in this example are from the additional learners completing secondary school and higher education. For example, by 2027 (the final row of this extract), the reduced repetition has led to the accumulation of an extra 1,747 learners having completed Form 4 (visible at the bottom row of the Form 4 column in the right-hand part of the table).

Each of these 1,747 contributes additional income to the Malawi economy over her/his working life. The CBA model takes results such as this example and then calculates the projected earned income net of costs for additional learners in each year, accumulated over their working life. The result is then compared with the initial investment and used to generate Benefit to Cost Ratios (BCR) and Internal Rates of Return (IRR) for each of the 4 investment areas.

2.4 Key assumptions

2.4.1 Assumptions for each of the 4 types of investment

The following assumptions are the basis for each of the four investment results.

- **Teacher training**: A 2013/14 investment in 600 additional primary teachers, corresponding to 1% of teachers, leads to a reduction in repetitions by 0.19% (USAID MTPDS), with the effect tailing off to zero over the following 3 years. The investment cost is drawn from data in the ESIP II education costing model.

- **Textbooks**: A 2013/14 investment in 7.5 million primary textbooks, being one quarter of the overall 30 million textbooks required to achieve a 1:1 book per subject per learner ratio, leads to a 1.85% increase in the later earnings of affected learners, based the research showing test scores the equivalent of 0.37 standard deviations higher than students in a class with no books (Michaelowa 2001). This 1.85% is based on the minimum likely increase of 5% per standard deviation derived from the meta-analysis of Hanuschek & Woessman (The role of school improvement in economic development, 2007). The effect tails off to zero over the textbook life (6 years according to a DFID-Malawi commissioned analysis of primary textbook replenishment, 2007). The investment cost is drawn from MoEST budget data, including the 2011 analysis of textbooks.

- **School improvement grants:** The 2013/14 budgeted investment in school improvement grants leads to dropouts decreasing by 0.24% and repetition decreasing by 0.31% (Skoufias, Shapiro – Mexico), with the effect peaking in 2016 and then tailing off to zero over the following 3 years. The investment cost is drawn from MoEST budget data, including the 2011 analysis of textbooks.

- **School construction:** The CBA model included the number of learners using 200 extra primary classrooms, at a rate of 80 per classroom. The figure of 80 per classroom was adjusted down from the average 105 enrolled learners per classroom, according to the ESIP II model, because the new classrooms may lead to better learner/classroom ratios. The benefits were evaluated using the Duflo Indonesia data, with earnings increase of 2.1% and 0.155 extra school years completed, the average of the Duflo ranges. The classrooms were assumed to last 30 years and the costs were taken from the ESIP II model.

2.4.2 Assumptions for direct benefits and costs in the CBA model

In order to calculate the additional income for the learners affected by each investment, the starting point is figures from the World Bank Country Status Report 'Education Systems in Malawi' (2010). These figures include measures of 2008 earnings for each of the 6 levels of education completed. They also include the public and private costs for each level of education.

It is not clear if the World Bank (2010) figures on average wage in Malawi are adjusted for unemployment or not. However it is implicitly assumed that wages can be taken as a proxy for the contribution of work, regardless of whether they are actually in paid work as those who are not

employed in the formal labour market are assumed to be contributing services of equal value in agriculture, other self-employment or household services. For example Foster (2011) quotes studies that have looked at the impact of education on earnings from subsistence agriculture and self-employment suggesting that education is 'nearly as valuable for the self-employed as it is for those in formal sector jobs. This assumption may not always hold true and it may be that those not entering employment are not working in equally productive jobs; instead they may be working in a less productive area or may be spending time just searching for jobs.

The World Bank data on mean income by education level was calculated for 30 year olds. The literature suggests that before this age people are likely to earn less and above this age they are likely to earn more. In order to guard against the benefits being overestimated, for this reason and for the potential unemployment referred to above, all of the benefits to education that are received have been reduced by 25%.

The wage and cost figures in the World Bank data (converted to Malawi Kwacha) have been adjusted for inflation to 2012 based on data from the Malawi National statistics Office.

There are no wage figures available for those receiving education at one level for a year or two but then drop out before completing that education stage (e.g. for those who drop-out after one year of university). For simplicity, the applicable wage used is that of the last level completed, e.g. those who drop out having completed only one year of University get the wage attributable to those who have completed Upper Secondary.

2.4.3   Assumption for indirect benefits in the CBA model

The World Bank wage figures are the direct benefits only and do not include the external social benefits to society of an individual's education. There are many benefits, additional to the direct benefits that need to be considered, These include indirect private returns (i.e. greater productivity in activities beyond formal employment, such as improved health through greater understanding of health issues, better use of financial assets), as well as social benefits (externalities), such as intergenerational benefits, health benefits, female fertility benefits, political benefits and social cohesion.

Monetising these returns is difficult. Nevertheless it is widely accepted that they are substantial and potentially far outweigh the direct returns. McMahon (2004) calculates them to be 80% of the direct returns, although it is noted that his 80% includes only some of the externalities. In this CBA, it is assumed that 80% should be added to direct benefits for indirect.

2.4.4   Evaluation over the years in the CBA model

The model is evaluated by multiplying the numbers of learners affected by a given investment completing each year with the corresponding benefits and costs per level completed.

The annual population growth in primary learners up to 2020 has been taken from the ESIP II model. Thereafter, input annual growth is assumed at 3.0%.

Life expectancy according to the UN 2010 for Malawi is 57. In the CBA model, it is assumed that learners affected remain in the workforce on average until age 57, also using the assumption that learners are aged 13 at Standard 7.

Taking account of this working life and the long-tail effects from the original 2013/14 investment, the model has been evaluated up to 2069, by when the marginal effect of an investment is zero or immaterial.

For net present value purposes, the results are discounted for future years using a discount rate (or social rate of time preference) of 10%, reducing to 9% after 30 years. The rate of 10% was provided by DFID, being the appropriate rate for Malawi. The reduction to 9% after 30 years is in accordance with HMG's Green Book recommendation, that a lower discount rate should be used in the case of periods exceeding 30 years (see below), with 9% from 10% for Malawi being approximately equivalent to the reduction in the Green Book from 3.5% to 3.0% for the UK.

3 Results and sensitivity analysis

3.1 Summarised results

Option 1 in the BC is £14 million SBS investment. The BCA compares the results of this proposed investment with Option 2, which is the counterfactual i.e. without such investment. Results on the application of the CBA model are summarised in the following table:

	Benefit to cost ratio (BCR)	Internal rate of return (IRR) %	2013/2014 investment £m
Teacher training	3.48	18.0%	2.2
Textbooks	3.68	20.2%	3.1
School grants	4.68	15.5%	7.6
School construction	2.97	15.8%	3.3

The returns from marginal investment in the one year, 2013/14, into each of the priority areas range for BCR from 2.97 up to 4.68 and for IRR from 15.5% up to 20.2%. These results are all substantial and appear to provide ample justification for Option 1 of the BC.

Note that the investment figures in the right-hand column are the estimates used in the CBA model. The BCRs and IRRs for each of the 4 priority areas should be the same regardless of the amount of level of investment into each (subject to maxima that can be utilised in one year). The total of the 4 investments happens to be greater than the £14 million.

Though in principle SBS is not earmarked to particular spending, the Annex of the Joint Financing Arrangement identifies the above 4 priority areas, thus it is likely and expected that much of marginal SBS funding is directed to these areas. In conclusion, other things being equal, it can be assumed that the returns from future marginal SBS are substantial.

Whereas the outcome of Option 2, which is simply no new investment at all, is no change in benefits or costs, DFID would nonetheless still be carrying on its other investments into the education sector, including the Keep Girls In School programme and the Phalombe TTC. The former involves DFID providing £37.5 million over 4 years and the BC for KGIS included a BCR estimated at 3.7.

Another way to look at the results is to examine the number of children directly benefiting from the proposed £14 million SBS investment. The nature of the investment in each of the 4 priority areas is targeted at all primary school children. For example, the primary school grants program at an investment cost of £7.6m in 2013/14 will reach all 5400 primary schools in Malawi and so all 4.3 million enrolled children will benefit, if only for one year. SBS has a very wide impact, for example compared to the KGIS program over 4 years which would directly benefit some 50,000 girls.

Another consequence of the SBS approach is that the impact of the investment is more sustainable than non-budget support aid. Even one year's investment into SBS can contribute to the building of long-term capacity within the education sector, leading to greatly enhanced aid effectiveness and value for money.

3.2 Sensitivity analysis summary

Each of the assumptions used in the BCA has been sensitivity-tested. The results of this sensitivity analysis are included in the table at 3.4. This table shows that the positive results of Option 1 are resilient to adverse scenarios tested.

It has been noted above that it is not the education input mix that determines quality education but factors like incentive mechanisms, institutional setup, school autonomy and accountability, political economy and management capacity in MoEST including change management skills. The sensitivity of such factors to learning outcomes are such that £14 million could be spent in 2013/14 on teacher training, textbooks, etc, with much smaller benefits than those predicted above. Conversely, aided by the influence of DFID at the SBS table, a more favourable environment on such areas could lead to much faster enhancement of education quality.

In other words, the investment outcome may not depend so much on the amount of money provided by DFID but rather on the context into which that money is given and the positive influence that DFID can bring to improve that context.

3.3   Sensitivity analysis workings

The sensitivity of the various assumptions on the quantified results is shown in the table below.

	Assumption	Adverse scenario	Before BCR/IRR	After BCR/IRR	Comments
1	Teacher training: Reduction in repetitions is 0.19%	Repetitions reduced by 20% less, i.e. 0.152%	3.48 18.0%	2.87 16.6%	
2	Teacher training: Reduction in repetitions effect tails off to zero over following 3 years	Reduction in repetitions effect tails off to zero over following 2 years	3.48 18.0%	2.90 16.9%	
3	Teacher training: Cost	20% increase in investment cost	3.48 18.0%	2.90 16.7%	
4	Textbooks: Increase in earnings is 1.85%	Increased in earnings is 20% less, i.e. 1.48%	3.68 20.2%	2.94 18.1%	All investment results remain substantial
5	Textbooks: Textbook life is 6 years	Textbook life is 4 years	3.68 20.2%	2.81 18.1%	
6	Textbooks: Cost	20% increase in investment cost	3.68 20.2%	3.06 18.5%	
7	School grants: Reduction in dropouts is 0.24% and in repetitions is 0.31%	Reduction in dropouts and in repetitions reduced by 20%, i.e. to 0.192% and 0.248%, respectively	4.68 15.5%	3.73 14.7%	
8	School grants: Reduction in dropouts and in repetitions effects tail off over 3 years after 2016 peak	Reduction in dropouts and in repetitions effects tail off over 2 years after 2016 peak	4.68 15.5%	3.95 15.0%	

	Assumption	Adverse scenario	Before BCR/IRR	After BCR/IRR	Comments
9	Schools grants: Cost	20% increase in investment cost	4.68 15.5%	3.90 14.9%	All investment results remain substantial
10	School construction: 80 learners per new classroom	20% reduction in new learners per classroom, i.e. 64	2.97 15.8%	2.38 14.5%	
11	School construction: Earnings increase 2.1% and 0.155 extra school years completed	Earnings and extra school year effects reduced by 20%, i.e. to 1.68% and 0.124 years respectively	2.97 15.8%	2.38 14.5%	
12	School construction: Classrooms assumed to last 30 years	Classrooms assumed to last 20 years	2.97 15.8%	2.68 15.6%	
13	School construction: Cost	20% increase in investment cost	2.97 15.8%	2.48 14.7%	
14	Direct benefits: Earnings for each level completed taken from World Bank report, already reduced by 25% for age and unemployment effects	Further reduction in all World Bank earnings figures by 20%	Effects vary for each of the 4 types of investment, but in line with many of the 20% reductions above, for example identical to 4 and 10/11 above		
15	Indirect benefits: 80% of direct benefits	Indirect benefits factor reduced by 20%, i.e. from 1.80 to 1.44	Identical result to 14 above		
16	Model is evaluated up to 2069, i.e. 56 years after 2013	Evaluation is cut off 15 years earlier, i.e. up to 2054	Effect of this scenario is small, e.g. teacher training BCR reduces from 3.48 to 3.37, while the IRR reduces from 18.00% to 17.97%		

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Annex A   Terms of reference

DFID Malawi

Terms of Reference: Economic input to the design of the DFID Malawi education portfolio

Background

General

1. The Malawi Education Sector Implementation Plan (ESIP), the first education SWAp, began in 2010 and ends in mid July 2013. ESIP is led by the Ministry of Education, Science and Technology (MoEST) and supported by a number of external development partners (DPs). DFID, the World Bank, Global Partnership for Education- GPE (formerly the Fast Track Initiative – FTI), the German Development Cooperation (through KfW) and UNICEF provide sector budget support. The ESIP is governed by a Memorandum of Understanding (MoU) signed by most DPs and the Government of Malawi.

2. The latest figures on Malawi's education status are captured by the 2011 EMIS data (Annex 1) and the ESIP Review (Annex 2).

3. DFID is providing £42 million over three years as pooled and earmarked Sector Budget Support (SBS), £3m for schools construction through the Education and Infrastructure Management Unit (EIMU) and £5 million over three years for improving domestic accountability and sector governance. In addition DFID is spending £37.5m on Keeping Girls in School. DFID's support to education is covered in more detail in Annex 3.

4. The MoEST along with the DPs are now designing the second phase of the education sector programme named as ESIP 2, a 3 year programme, which will be implemented from July 2013.

5. Education is a priority sector for DFID Malawi's current country strategy and Operational Plan. Exactly what we focus on and the instruments used will be determined by a number of issues including maximising our development impact, value for money assessments and risk analysis.

6. It will also be largely based on a full understanding of the performance of DFID's current programme supporting the SWAp; the Malawi Education Sector Reform Programme (MESRP) which is due to end 30th June 2013. The new programme, provisionally titled Strengthening Education in Malawi (SEIM) is largely a continuation of MESRP however the components and methods of delivery will be determined, in part, through the results of this economic analysis.

Specific to the economic case

7. Under the UK Government's Structural Reform Programme, new programme design comes under the a 5 stage Business Case comprising 1) the strategic case, 2) the appraisal case, 3) the commercial case, 4) the financial case and 5) the management case. The economic appraisal forms a critical part of the appraisial case and is one of the main drivers in deciding on feasible options to achieve the results DFID is looking for in the sector.

8. Concurrently the MoEST, development partners and other stakeholders are developing ESIP 2 and refining future education plans for the coming 5 years. MoEST has confirmed that it welcomes the proposed support in developing and appraising the economic benefits for potential interventions that DFID might make. The Ministry and donors appreciate the

need to ensure that the greatest education and development gains are achieved from the investment.

9. The design of DFID Malawi's support to the education sector will be of interest across DFID's human development department. It will be important to explore how new sector budget support (SBS) builds on the reviews (internal and external) of previous SBS and can deliver and demonstrate better results. Improving learning outcomes, especially for girls, are key priorities for DFID Ministers. The programme design will need to explore whether sector support can deliver significant improvements in results in these areas with potentially greater sustainability than more narrow project funding.

10. DFID Malawi therefore requires expertise from a consultant or group of consultants to deliver a full cost benefit analysis of the options laid out under SEIM to assist the education adviser to make an informed decision about which options delivers the best results.

Purpose

- To provide the necessary economic input to the design of DFID's potential support to the education sector through its next programme, SEIM. This will include a strong role in the design of the programme, and optimisation of instruments, economic appraisal of various options for achieving the objective, and a comprehensive assessment of value for money considerations.

Outputs

11. Three reports:

   a. An inception report of no more than 5 pages setting out the intended methodology for the appraisial, to be agreed by DFID.
   b. A summary of cost benefit considerations of relevance to Malawi's current and likely future education strategies and resource prioritisation, for the MoEST and development partners. This will be made public and should be written in plain English suitable for a non technical audience.
   c. Documentation on the economic issues for each of the four proposed options under SEIM as set out in the Product Description below.

Scope of work

12. The first stage of the Business Case approach is the Strategic Case, which identifies the problem, and sets out the case for intervention. We would expect the consultant(s) to have minor involvement with this stage however bringing best available evidence and current thinking to ensure the design options are credible will be important.

13. The consultant(s) will primarily be involved with the preparation of the Appraisal Case. The consultant(s) will work closely with DFID Malawi's Education Adviser to evaluate the costs and benefits of each option, in economic terms, but also factoring in political, institutional, social, environmental and fiduciary considerations. A full cost benefit analyses of the options will then be carried out by the consultant(s).

14. This will require the development of plausible counterfactuals, quantitative analysis of the costs and benefits of the options under consideration, and a robust analysis of the intervention logic and of the assumptions that underpin the logical chain from inputs to outputs, outcomes and impact. Costs and benefits should be monetised where possible, and where quantification is not possible, a narrative assessment will be required to outline how they are likely to affect the net benefits. Private sector option for delivery should be considered, as well as public sector. For large programmes like these it should include assessment of the incidence of benefits, macroeconomic and fiscal impacts, impact on

competition, and financial sustainability. Based on the results of this analysis, the DFID education portfolio design team will choose a preferred option for each programme.

15. DFID's requirements from the cost benefit analysis (CBA) are set out in the February 2009 How to Note: Strengthened Approach to Economic Appraisal (Annex 4). The fundamental purpose of the CBA is to address 3 questions:

    i. Is it likely that the preferred option's incremental economic benefits would justify its incremental economic costs?

    ii. Is it clear that the net incremental economic benefits of the preferred option would be greater than those of the other options that were considered?

    iii. Is the preferred option designed optimally to maximise net incremental economic benefits?

16. For the preferred option it must be demonstrated that the net benefits are likely to positive, and sensitivity analysis will be carried out for key variables as appropriate. Analysis will also be carried out to determine the key risks, and at what point the net benefits are no longer likely to be positive.

17. In the third and final stage the preferred option for each programme will be fine-tuned to ensure that it is designed to deliver the greatest possible value for money, for the people of Malawi and the UK taxpayer. This would include a Value for Money (VfM) assessment, in line with DFID's VFM guidance note) including developing VfM metrics for the programme, and an assessment of the extent to which the expected results can be attributed to DFID. This should include analysis of the conditions under which the programme will no longer represent value for money.

18. The consultant(s) may also be asked to contribute to the Commercial Case if appropriate, such as providing an advice of how markets are likely to respond to the large sums of money likely to be spent on procurement under the new SWAp, and how this could affect competition, and DFID's ability to secure maximum value for money in its commercial and procurement arrangements. The consultant(s) may also be asked to input on fiduciary issues in design (a separate Fiduciary Risk Assessment and Procurement Assessment are being done – the Terms of Reference for these will be shared to avoid duplication and ensure maximum coherence).

Methodology

19. The contexts in which DFID operates are often characterized by moderate to severe lack of data, which undermines the ability to quantify and monetise the expected costs and benefits of the considered options. However reasonable data is available in education as was used for development of the Keeping Girls In School programme in 2011. Where data is not available for Malawi, the analysis should be supplemented by regional comparisons. Because of the size of the programme, it will be quality-assured by the DFID Chief Economist.

20. The choice of methodology will have to be presented in an inception report (output A above) and agreed with DFID within 3 working days from the beginning of the contract.

Reporting

21. The consultant will report directly to the Education Adviser and Economic Adviser in DFID Malawi.

Recipient

22. The recipient will be DFID Malawi, as the economic inputs will be a key part of DFID Malawi's education business case, but these will be shared with the MoEST and other development partners to inform their own thinking.

Competencies

Required competencies

- At least 5 years experience as an economist
- Previous experience of delivery of DFID economic appraisal for an education programme
- Substantial expertise and experience around aid instruments and an in depth knowledge of current and emerging thinking around SWAps, fiduciary risk, value for money, aid effectiveness and results maximisation
- Substantial experience in cost-benefit analysis, particularly in the context of government interventions
- Excellent written and oral communications skills

Desired competencies
- Experience in the field of education financing
- Experience of the Southern Africa education context

Timing

23. DFID Malawi estimates the consultancy to require up to 25 days work, to be undertaken early April. Therefore, once the consultant(s) have prepared their inception report, he/she/they and the DFID Education Adviser will agree a more precise figure for how many days work are required. It is expected that the vast majority of this will need to be carried out in Malawi.

24. This assignment must be completed by mid-May. Given the short time frame the work could be split between consultants – for example one with expertise in economic appraisal and VFM and another with expertise in aid instruments and results. The consultants would work under the lead consultant's supervision to ensure the different pieces are well integrated.

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Annex B   List of documents reviewed

MESRP business case draft

Malawi education planning costing model – final version 1.3

Final ESIP review report

Various DFID How to Notes – on economic appraisal, business case, commercial case, evaluating influence

DFID design and methods impact evaluation

MESRP final January 2010

Economic appraisal of 2010 MESRP

Economic appraisal of DFID's investment in the Malawi health sector

Economic appraisal of Zambia Education SBS

Malawi Keep Girls in School business case and economic appraisal

DFID guidance note on estimating returns to education

DFID results and VFM guidance for education policy and programmes