



ECARDA

MACRO EDUMETRICS

Productivity, Efficiency & Effectiveness
Paper 1

This first paper describes, examines and critiques three measures that have a bearing on how well a school may be performing. An illustration of these three measures applied across all the primary schools in a particular local authority area leads to questions about what may constitute an objective and valid measure of a school's performance. A proposed second paper will examine further samples and undertake more detailed analyses.

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April 2012

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INTRODUCTION

There is now more publicly available information about schools than ever before. Two purposes are cited for this proliferation of information: (1) helping parents make informed choices when expressing their preference for a school for their children; and (2) holding schools to account.

There is a risk that the sheer quantity of information occludes the achievement of both of these purposes.

The object of this exercise is to define and explore three key edumetrics: Productivity, Efficiency and Effectiveness. To start with the definitions:

SECTION 1 DEFINITIONS

1. PRODUCTIVITY

Productivity shows the relationship between overall learner attainment and overall learner progress. In a sense, it represents what is commonly described as achievement.

The measure for attainment for Key Stage 2 is taken as the proportion of the cohort attaining level 4 or better in both English and mathematics. For Key Stage 4 the measure for attainment is taken as the proportion of the cohort attaining 5 or more GCSEs at grade C or better, including English and mathematics.

The measure for learner progress at Key Stage 2 is taken as the value-added score for English and mathematics. The measure for learner progress at Key Stage 4 is the value-added score which is derived from for the best 8 GCSEs (or equivalent) results including English and mathematics.

The relationship is represented in the form of a scattergraph where the axes intersect at their respective national medians. Thus the chart is divided into four quadrants.

Below average attainment

Above average progress

Below average attainment

Below average progress

Above average attainment

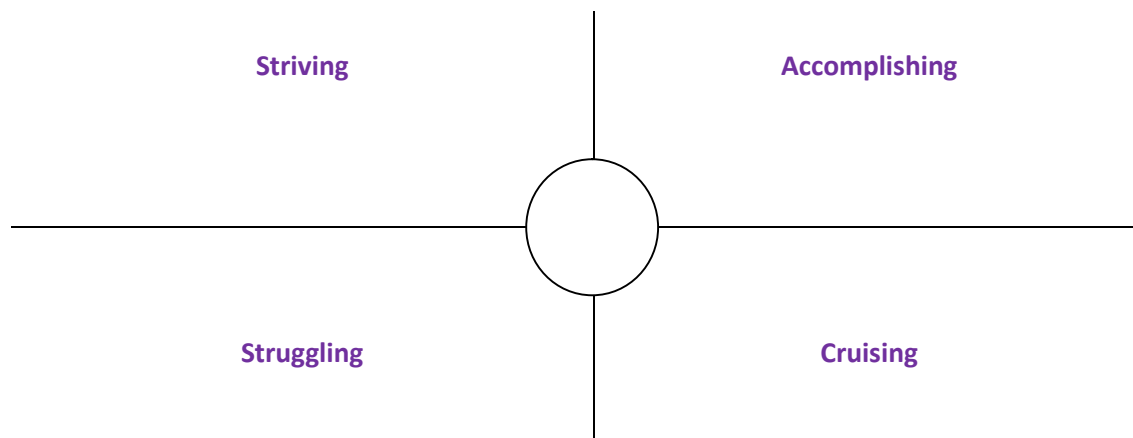
Above average progress

Above average attainment

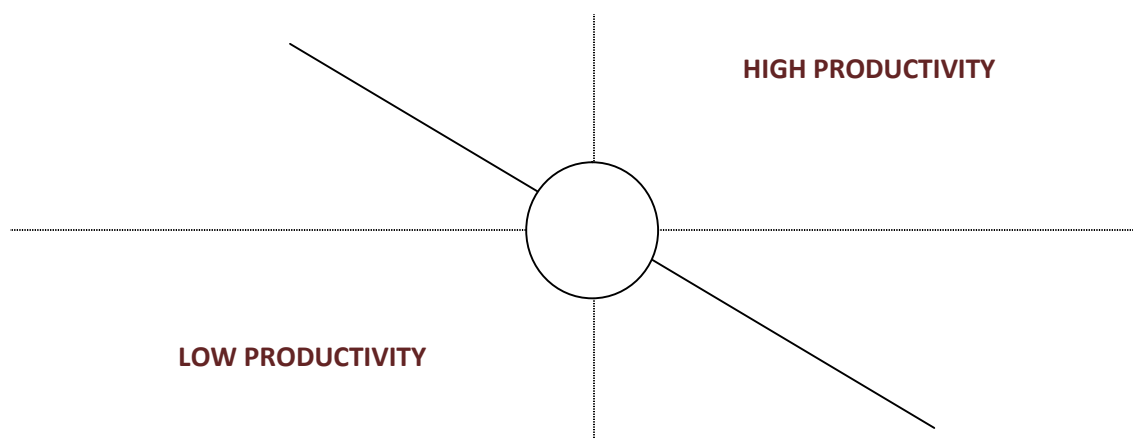
Below average progress

It is possible to label these quadrants in a way which classifies schools. Clearly such labelling, as shown below, is subjective, but it may help identify schools which deserve recognition or warrant help.

Schools clustered around the intersection of the axes may generally be described of 'average productivity'.



Beyond those clustered around the centre, a two-way split of the chart along the diagonal shown below allows a categorisation of schools to be made according to their productivity.



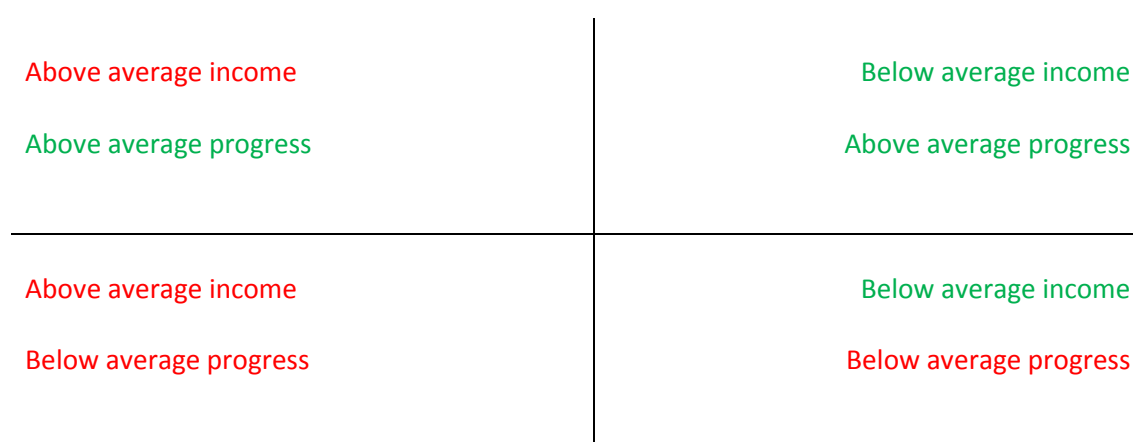
Some local authority-wide charts in the next section illustrate the distribution of schools according to this measure.

2. EFFICIENCY

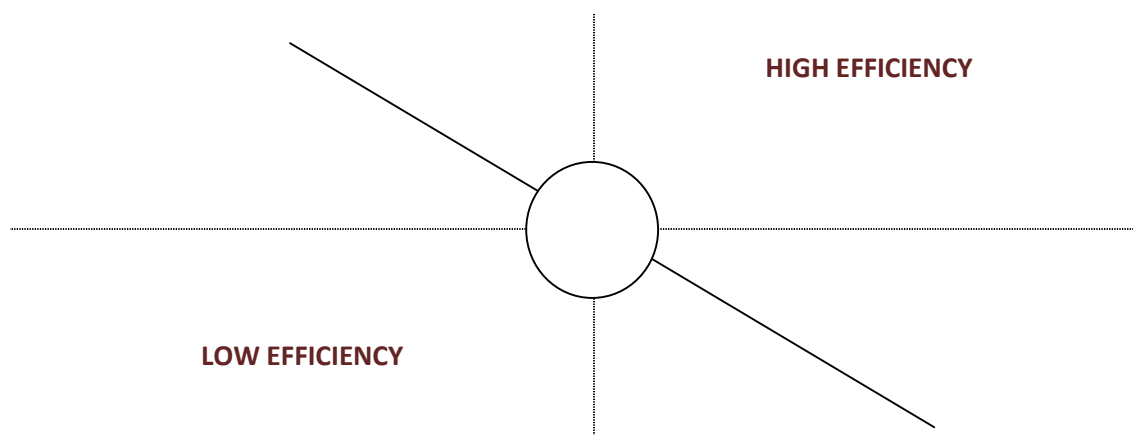
Efficiency shows the relationship between the grant funding received by a school and the progress that learners make in that school.

The measure for learner progress at Key Stage 2 is taken as the value-added score for English and mathematics. The measure for learner progress at Key Stage 4 is the value-added score which is derived from the best 8 GCSEs (or equivalent) results including English and mathematics.

The relationship is represented in the form of a scattergraph where the axes intersect at their respective national medians. The horizontal axis of grant income is expressed “in reverse”. Thus, the chart is divided into four quadrants.



Beyond those clustered around the centre, a two-way split of the chart along the diagonal shown below allows a categorisation of schools to be made according to their efficiency.



Some local authority-wide charts in the next section illustrate the distribution of schools according to this measure.

3. EFFECTIVENESS

Effectiveness is already defined and is used by OFSTED in their inspections. It is a composite measure of the quality of education provided at a school that 'sums up' judgements made on four key areas of school activity, namely, and quoting from the evaluation schedule for the inspection of maintained schools and academies:

- 1) achievement of pupils in the school
- 2) quality of teaching in the school
- 3) behaviour and safety of pupils at the school
- 4) quality of leadership in and management of the school.

In addition, inspectors must consider:

- the extent to which the education provided by the school meets the needs of the range of pupils at the school, and in particular the needs of disabled pupils and those who have special educational needs, taking into account the progression and destination of pupils when they leave school
- how well the school promotes all pupils' spiritual, moral, social and cultural development by providing positive experiences through planned and coherent opportunities in the curriculum and through interactions with teachers, other adults and the local community as shown by pupils:
 - being reflective about beliefs, values and more profound aspects of human experience, use their imagination and creativity, and develop curiosity in their learning
 - developing and applying an understanding of right and wrong in their school life and life outside school
 - taking part in a range of activities requiring social skills
 - developing awareness of, and respect towards, diversity in relation to, for example, gender, race, religion and belief, culture, sexual orientation, and disability
 - gaining a well-informed understanding of the options and challenges facing them as they move through the school and on to the next stage of their education and training
 - overcoming barriers to their learning
 - responding positively to a range of artistic, sporting and other cultural opportunities, provided by the school, including, for example developing an appreciation of theatre, music and literature
 - developing the skills and attitudes to enable them to participate fully and positively in democratic, modern Britain
 - understanding and appreciating the range of different cultures within school and further afield as an essential element of their preparation for life.

A measure of effectiveness is expressed in terms of a whole number between 1 and 4, where, as published in inspection reports, the numbers carry the meanings set out below:

Grade 1	Outstanding
Grade 2	Good
Grade 3	Satisfactory
Grade 4	Inadequate

Criteria, outline guidance and grade descriptors associated with each key area and with overall effectiveness scope and pitch the judgements made, which facilitates consistency.

The distribution of grades for effectiveness is set out below. These data are found in each published inspection report. The text below the table, also published in inspection reports, explains the data source and how the data should be interpreted with caution.

Type of school	Outstanding	Good	Satisfactory	Inadequate
Nursery schools	46	46	8	0
Primary schools	8	47	40	5
Secondary schools	14	38	40	8
Special schools	28	48	20	4
Pupil referral units	15	50	29	5
All schools	11	46	38	6

New school inspection arrangements have been introduced from 1 January 2012. This means that inspectors make judgements that were not made previously.

The data in the table above are for the period 1 September 2010 to 31 August 2011 and represent judgements that were made under the school inspection arrangements that were introduced on 1 September 2009. These data are consistent with the latest published official statistics about maintained school inspection outcomes (see www.ofsted.gov.uk).

The sample of schools inspected during 2010/11 was not representative of all schools nationally, as weaker schools are inspected more frequently than good or outstanding schools.

Primary schools include primary academy converters. Secondary schools include secondary academy converters, sponsor-led academies and city technology colleges. Special schools include special academy converters and non-maintained special schools.

Percentages are rounded and do not always add exactly to 100.

At the time of writing, further changes are proposed to the interpretation of overall grades of effectiveness. Five of which are set out below:

“From September 2012, we propose that:

- 1) schools cannot be judged ‘outstanding’ unless their teaching is ‘outstanding’
- 2) schools will only be deemed to be providing an acceptable standard of education where they are judged to be ‘good’ or ‘outstanding’
- 3) a single judgement of ‘requires improvement’ will replace the current ‘satisfactory’ judgement and ‘notice to improve’ category
- 4) schools judged as ‘requires improvement’ will be subject to a full re-inspection earlier than is currently the case
- 5) a school can only be judged as ‘requires improvement’ on two consecutive inspections before it is deemed to require ‘special measures’

The three edumetrics described above: productivity, efficiency and effectiveness, are all compound measures.

Quantifiable and elemental outcome measures which inform these compound measures include:

- a) Pupil attainment
- b) Pupil progress
- c) Pupil attendance
- d) Grant funding per pupil

Productivity is informed by the relationship between (a) and (b), both of which are outcome measures;

Efficiency is informed by the relationship between (a) and (d), both of which are outcome measures;

Effectiveness is informed by (a), (b), (c) and a number of other factors, including some input measures, such as the quality of teaching and the quality of leadership.

The next section illustrates these edumetrics when applied to schools across a local authority region.

SECTION 2 ILLUSTRATIONS

Chart 1

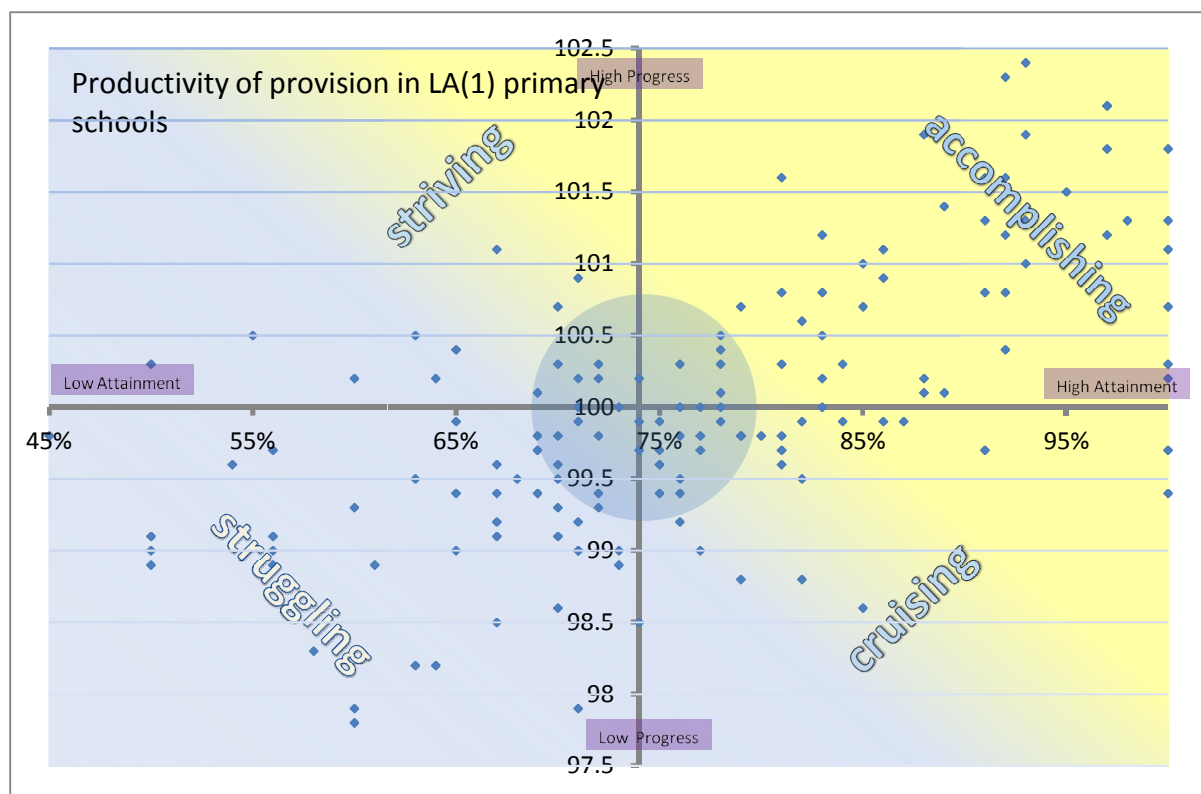


Chart 2

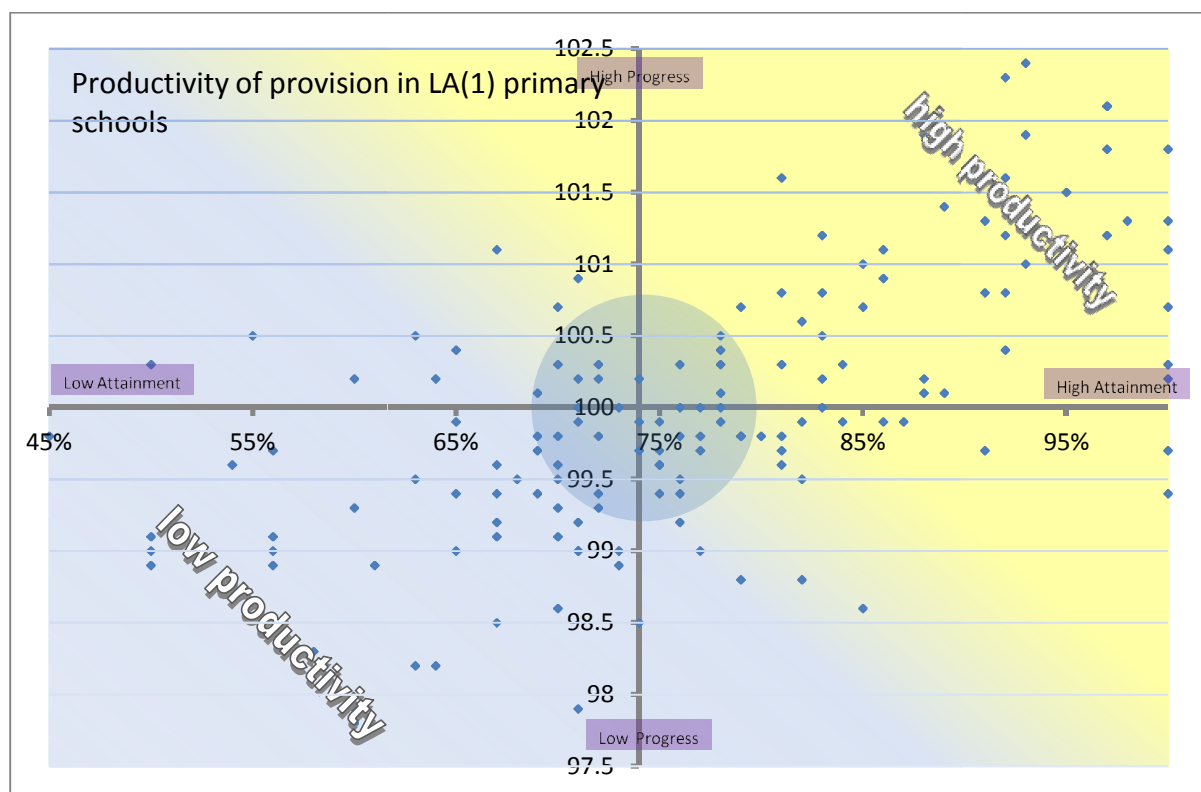


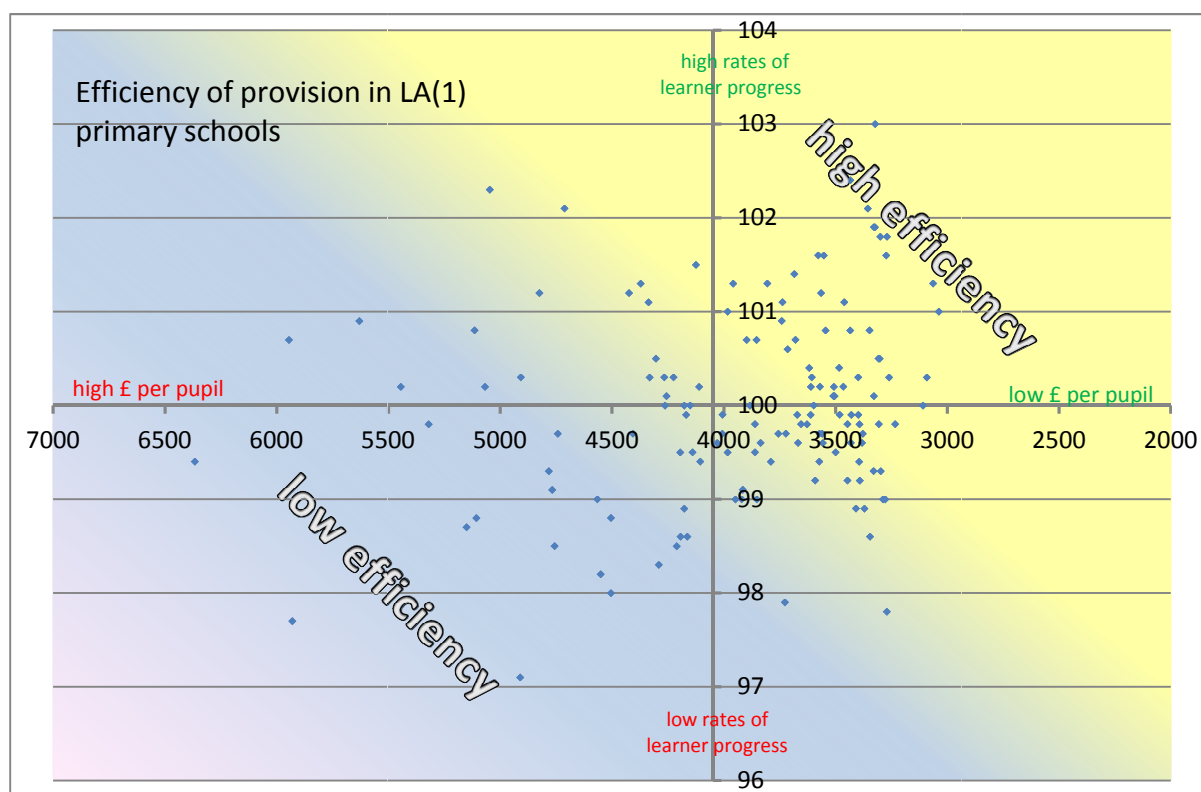
Chart 3

Chart 1 and **Chart 2** show the distribution of primary schools for which data is publicly available¹ across a selected local authority [LA(1)] when average learner progress is plotted against average attainment. Chart 1 illustrates a 4-way categorisation, whilst Chart 2 focuses on a simple 2-way categorisation. The central disc suggests an area “around average”.

There is a weak relationship between the variables ($r^2 = 0.47$). This is unsurprising as higher rates of progress typically lead to higher levels of attainment. However, schools where children enter with very low levels of attainment may enable high rates of learning progress and yet achieve levels of attainment below national norms: hence the “striving school” category which recognises the school’s success.

The number of schools in the productivity chart is 139. 47 (34%) fall in the accomplishing quadrant; 14 (10%) fall in the striving quadrant; 28 (20%) fall in the cruising quadrant; and 41 (29%) fall in the struggling quadrant. (9 schools are not counted because they fall on boundary lines). When classified by high productivity and low productivity the split is 78:61, or 56%:44%.

Chart 3 shows the distribution of primary schools for which data is publicly available¹ across a selected local authority [LA(1)] when average learner progress is plotted against per pupil grant income (expressed in reverse). The number of schools in the efficiency chart is 133. When classified by high efficiency and low efficiency the split is approximately 83:50, or 62%:38%.

The proportion of high efficiency schools that are also high productivity schools will be looked at in Phase 2 of this research, as will be the proportion of low efficiency schools that are also low productivity schools.

Chart 4

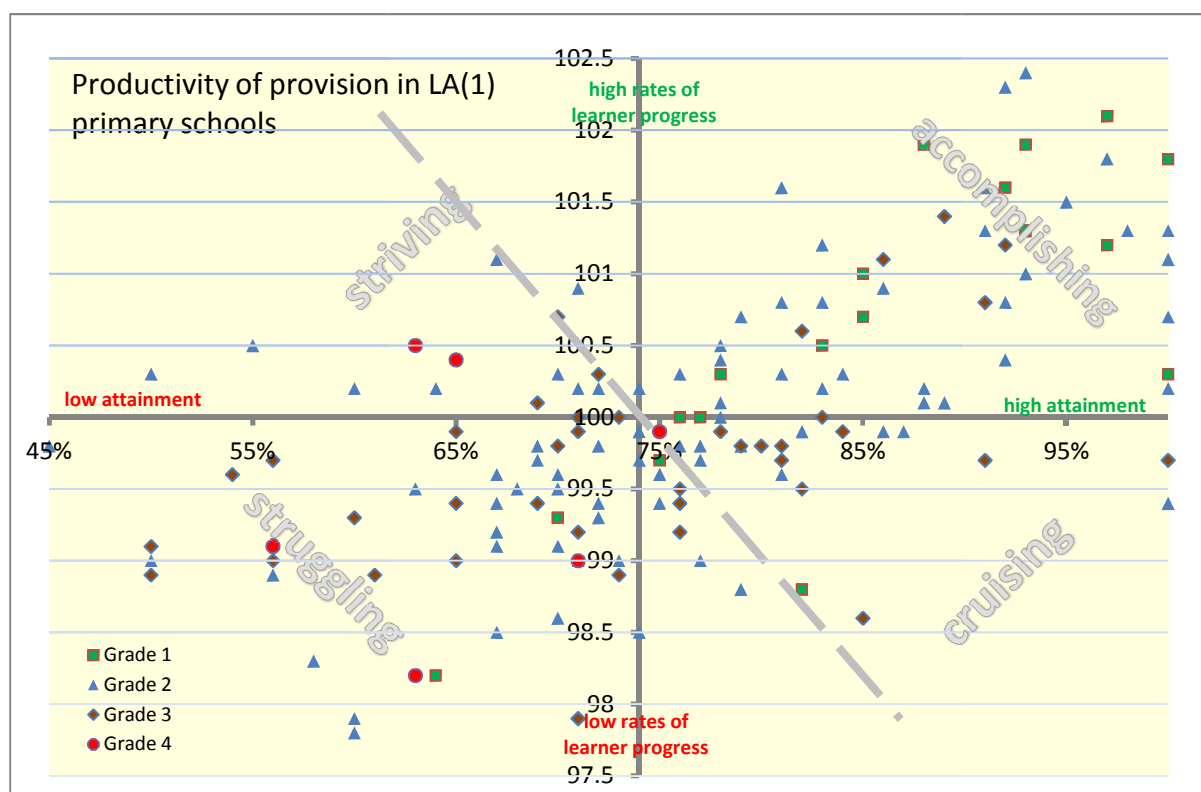


Chart 5

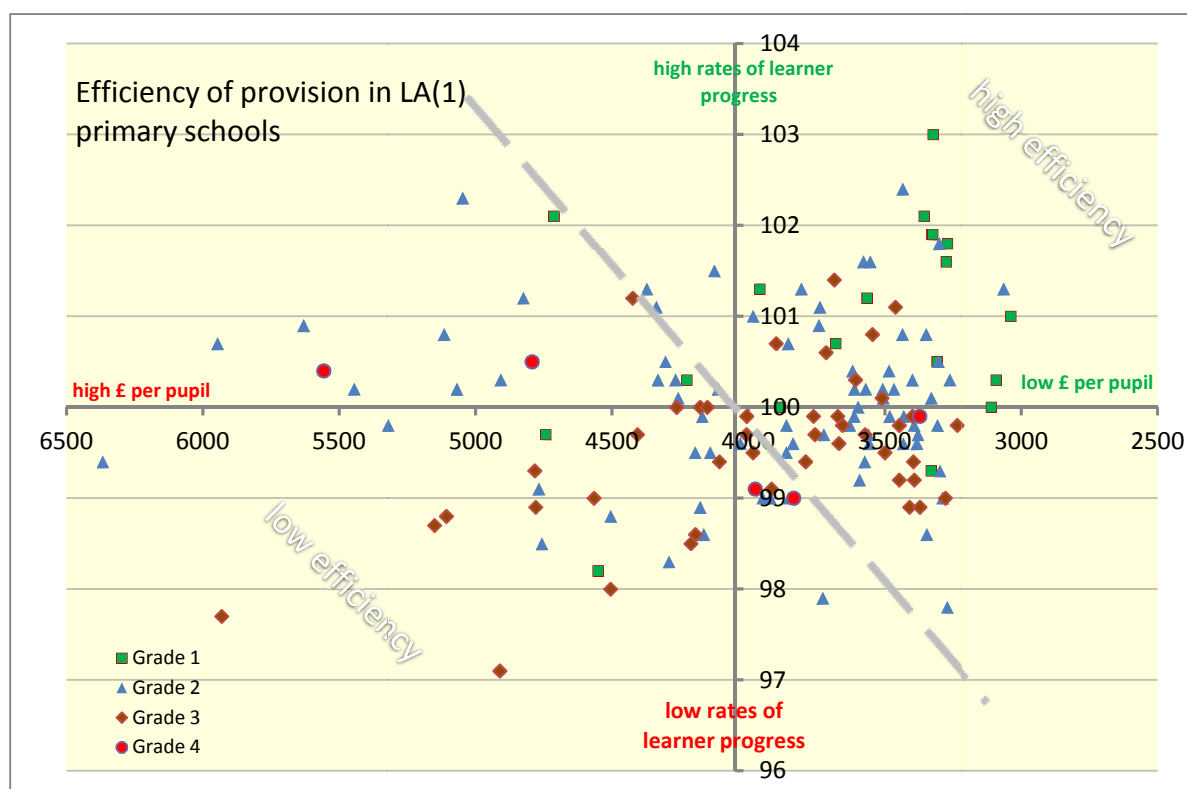


Chart 4 codes each plotted point (school) on the productivity chart with its latest² OfSTED grade.

Out of the 18 schools graded outstanding, 12 are clearly in the accomplishing quadrant, 2 are in the cruising quadrant, 2 are in the struggling quadrant and none is in the striving quadrant. (The two remaining are on the border of accomplishing and cruising.

Out of the 6 schools graded as inadequate, none is in the accomplishing quadrant; 2 are in the striving quadrant; 1 is in the cruising quadrant; and 3 in the struggling quadrant.

Further analyses of larger samples with a consideration of all four OfSTED grades are beyond the scope of this first paper but will be undertaken as funding for this research becomes available.

What is striking in Chart 4 is the proximity on the chart of significantly different OfSTED grades. The adjacency of a grade 1 and grade 4 in the struggling quadrant is particularly noteworthy.

Chart 5 codes each plotted point (school) on the efficiency chart with its latest² OfSTED grade.

Out of the 18 schools graded outstanding, 14 are on the high efficiency “side” whilst 4 are on the low efficiency “side”.

Out of the 5 schools graded as inadequate in this sample, one is clearly on the high efficiency side whilst another two are close to the border between, and two are clearly on the low efficiency side.

Further analyses of larger samples with a consideration of all four OfSTED grades are beyond the scope of this first paper but will be undertaken as funding for this research becomes available.

Again, the relative distribution of each of the OfSTED grades and the proximity of different grades are matters of interest and for further examination.

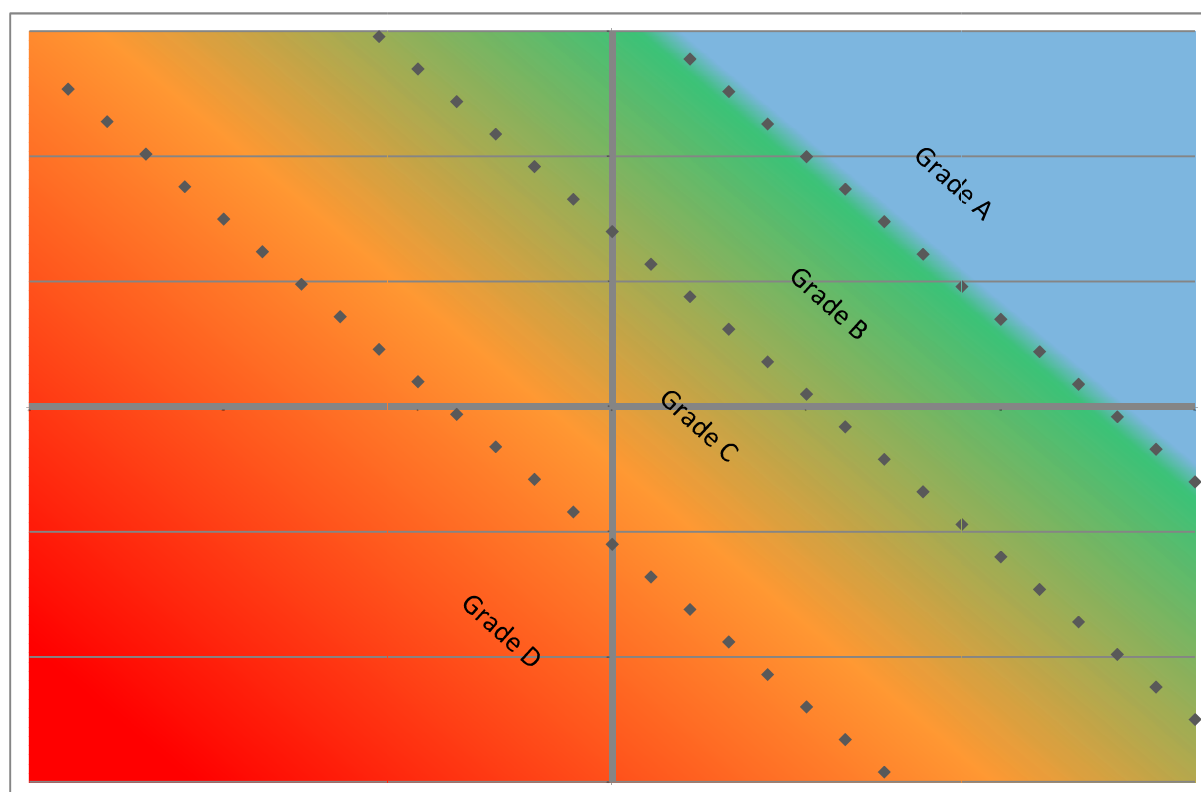
SECTION 3 INITIAL CONCLUSIONS

The three edumetrics of productivity, efficiency and effectiveness are interrelated because they share elemental measures. That said, they tell their own unique story about a school's performance.

There are examples of significantly different measures of effectiveness (OfSTED) being made on schools that share similar measures of productivity. This feature is also apparent with schools of similar efficiency.

A 2-way categorization of schools into high or low productivity, or into low or high efficiency inhibits useful comparisons with the 4-point OfSTED scale. Given the distribution of data, a 4-way categorization may be more useful for comparison purposes and more validly model the real world.

The "blank graph" below suggests a way in which the spectrum may be divided into 4 bands for both productivity and efficiency measures. More work is needed to identify positions of boundary lines.



Given that the three edumetrics of productivity, efficiency and effectiveness are not mutually exclusive, perhaps they do give different and complementary perspectives of a school's effectiveness.

Just as the drawing of a building may be presented as plan, front elevation and side elevation, so the "drawing" of a school's performance may be expressed in terms of all three measures. Thus, a school with a "triple A" rating would have scored the highest grade on all three measures. The first two measures could be updated annually through the DfE data collection and publication procedures.

A BBA school, for example, would have scored B for productivity, B for efficiency and A (or Grade 1) for overall effectiveness (OfSTED). This fuller, yet compact, picture of school performance might just be more informative for parents and more useful for school accountability.

SECTION 4 FURTHER WORK

As Phase 1 work, this paper has used for the purpose of illustration, analysis and inference, the published data on primary schools in one local authority.

The provision by the Department for Education of publicly accessible national school datasets is recognised and valued. This paper has drawn on 2010-11 year end school performance data and school finance data. The latter is gathered through consistent financial reporting arrangements. Schools that were academies during this period were required to send their financial reports to Young Peoples Learning Agency, now known as the Education Funding Agency. It was expected that EFA would send these reports to DfE so they may be published. At the time of the release of this paper this had not happened, though officials at DfE refer to a delay with availability pending.

Phase 2 work

Undertake a similar exercise as in this paper but related to secondary schools.

Extend the sample size to include more than one local authority.

Some interesting questions to be investigated in Phase 2 include:

Q1 Are there differences between the secondary and primary distributions of productivity, efficiency and effectiveness?

Q2 If there are differences across school phases, what are they and do they relate particularly to any of the three edumetrics' categories?

Q3 For each phase:

- I. To what extent are productive schools efficient?
- II. To what extent are efficient schools productive?
- III. To what extent do the OfSTED grades of overall effectiveness relate to productivity?
- IV. To what extent do the OfSTED grades of overall effectiveness relate to efficiency?
- V. Are there differences across local authority areas?
- VI. If there are differences across local authority areas, what are they and do they relate particularly to any of the three edumetrics' categories?

Q4 Are any of the edumetrics significantly different for academies?

Phase 3 work would include case study work, investigating schools whose measure of effectiveness differed significantly from the measures of productivity and/or efficiency.

SECTION 5 SOURCES AND REFERENCES

All the data were taken from the DfE 2011 performance tables.

The local authority in the sample is Somerset.

Schools included were those with age 11 pupils on roll.

¹ Schools whose data were suppressed because the numbers were too small for statistical inference were discounted from this exercise.

Schools whose data had not been collected for any reason were discounted.

Special schools were discounted.

² The OfSTED report was taken as the latest available. Dates are logged as part of this research.

Where a school had received a letter from HMCI confirming that its performance had been sustained, the date of this letter was logged and taken as the latest judgement.

Where HMI monitoring reports were the latest reports, the initial grade of the last full inspection was retained.

Extracts from the Evaluation Schedule for the Inspection of Maintained Schools and Academies have been used in Part 3 of Section 1.

Extracts from the common text found at the end of school inspection reports is also used in Part 3 of Section 1.

SECTION 6 – ABOUT EDUMETRICS.ORG.UK

Edumetrics.org.uk is the address given to the research and development branch of ECARDA Ltd.

ECARDA (Education Consultancy, Advice, Research & Development Associates) was registered in England as a company in 2005 and has on call over 30 independent expert consultants who serve the education sector.

Clients include schools, local authorities, multi-academy trusts and government agencies.

A suite of management tools that facilitate school self evaluation, improvement planning and performance management remain the most popular recurring service to schools.

Supporting schools converting to academy status is currently the most active area of activity.

Past topics of commissioned research include:

- a) An evaluation of the provision of training for tutors of mathematics in the prison sector.
- b) What constitutes the effective teaching of mathematics 25 years after the Cockcroft Report?
- c) What inputs in a Children's Centre have a significant impact on children's educational outcomes?
- d) An identification of the significant inputs that transformed a large comprehensive school with median outcomes to one of the national top performers.
- e) The development of teacher standards specifically for teachers of mathematics.
- f) The development of context free measures of school pupils' progress.
- g) The development of alternative or complementary school performance measures.

For more about ECARDA please visit www.ecarda.co.uk or contact enquiries@ecarda.co.uk

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