School size and student attainments:

Some New Zealand data

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1. Introduction

There is currently a vigorous international debate on the effects of *class* size on student attainments of various sorts (mostly academic). However there is also some important work being done on the effect of *school* size on the kind of "climate" that exists within a school that may have an independent effect on student attainments, over and above any effects of class size. When making international comparisons, it is important to consider many contextual issues that may be unique to each of the countries involved in the comparison, since such things as "school climate" are very susceptible to contextual issues. Hence conclusions about such things as the educational consequences of school size that are drawn from research in one country, should not be assumed to be applicable in another. I intend to illustrate this point with the data reported on here.

New Zealand has been involved in "restructuring" the provision of schooling in many areas of the country, involving the closing of many smaller schools. These "Network Reviews" (MOE, 2003) are focused on "giving all students access to quality education into the future", through ensuring such things as:

- Long-term stability;
- Better and more effective use of resources;
- Professional support for teachers; and
- A larger community of support.

A problem with school size, particularly at the secondary level, seems to revolve around a tension between the number of students that are required to provide enough teachers to give full curriculum coverage at the basic and advanced levels, and the number of students beyond which bureaucracy becomes a problem with a loss of the sense of community (students and teachers known to each other) which many studies show to be important in student learning. Ayers *et al* (2000) provide a fairly comprehensive review of the issues involved. Much of the research debate is around the search for an optimum size (or a size range) for student learning at various levels of schooling. Hence the purpose of this paper is to determine if there is any research support for schools of any particular size at the primary and secondary levels, from an analysis of data from New Zealand schools.

1.1 What counts as "too small"?

What counts as a minimum size varies between sectors and varies historically (Richmond 1992), as well as varying between countries. In 1963 in the UK 400 was thought to be the border below which secondary schools were regarded as too small. But as more students stayed on at schools longer and longer this lower threshold had moved up to 600. By the late 80s, market forces arguments pushed for 900, but the consensus (Richmond argues) seems to accept 600 as the point below which it is thought difficult to offer a sufficiently broad curriculum. At the primary level, Hopkins and Ellis (1991) report the UK government as seeing schools with fewer than 60 pupils as "too small". Francis (1992) suggests that this was true in the 1960s, but that it rose to 100 in 1981, and seems now to have settled around 90. The U.K. Audit Commission's 1990 Report (Rationalising Primary School Provision) is quoted as saying that "the threshold size below which unit costs begin to rise steeply is usually between eighty and ninety pupils".

Of course there are many other factors that co-vary with school size – most small schools (both primary and secondary) are in relatively isolated rural districts, and countries vary enormously in the distribution of their school age populations between rural and urban areas. In New Zealand, the Ministry of Education (1991) reported that 1 in 3 primary schools had fewer than 50 students (p. 10), and that over 90 % of schools with 1 or 2 teachers (less than 50 students) were in rural areas (p. 7). Further, there can be no rational comparison between an urban school which is "too small" because parents have "voted with their feet" due to some perceived inadequacy in its performance, and a school of the same size in a rural area which provides for all the relevant pupils over a wide area. Hence school size *per se* does not necessarily explain anything – or more subtly, it might explain different things under different circumstances.

2. The secondary sector

In the USA, in an analysis of the NELS88 Longitudinal data, Lee and Smith (1997) found that aggregate achievement after controlling for background factors, was highest in secondary schools between 600 and 900 students (see also Bracey 1998). In an earlier meta-analysis of effective secondary schools (Lee, Bryk & Smith, 1993) the authors had concluded that "the ideal high school enrols between 500 and 600 students" (p. 189). The extensively replicated "Matthew Project" (see Howley et al, 2000 for a summary) concludes that optimal size is contingent on community SES factors, "on the basic principle that the poorer the community, the smaller the schools should be." In this regard, the Lee and Smith analysis showed that in secondary schools with fewer than 301 students, the usual strong negative relationship between poverty and achievement was strongly reduced.

The "Matthew Project" replicated studies by Friedkin and Necochea (1988) and Howley (1996) in four states. The original studies had concluded that small schools benefited academic outcomes in impoverished communities, but that the attainments of students from wealthy communities were benefited by larger size schools. In terms of academic excellence these findings were confirmed in each of the four replications, involving median splits of all schools in each state (Georgia, Montana, Ohio and Texas), using the relevant state mandated tests as output criteria. With regard to equity outcomes, all of the studies (original and replications) "show … the relationship between achievement and SES is substantially weaker in the smaller schools than in the larger schools." (Howley et al, 2000, p. 4)

A study by Bradley and Taylor (1994) looked at the aggregated data on all 4,620 secondary schools in England. They had data on school type, its gender mix and admissions policy. They also had aggregate SES data on each school catchment area, some local labour market variables and pupil/teacher ratios. Their output criterion was the percentage of student leavers with five or more GCSE passes at grades A-C in 1992. School size was determined by the number of students in the 15-16 year old age cohort.

Like the US studies of the NELS88 data, Bradley and Taylor found a non-linear relationship (an inverted U) between school size and their output criterion (which they saw as at the high academic end of the possible outcomes for schools). With regard to this output, they concluded that small is not beautiful, with the optimum 15-16 year old cohort being around 225 students. This would translate into an optimum school size somewhat larger than the findings of Lee and Smith (1997) and Bracey (1998) in America.

Above this size, high academic attainment begins to decline, while below there may be other advantages, but high academic attainment is not one of them. Howley et al (2000, p.5) conclude that:

> Even in affluent communities … schools serving 1,500 or more students might have diseconomies of scale and bureaucratic operating modes that are not educationally hospitable. Indeed a wide consensus seems to have emerged (cf. Fulton, 1996) that schools larger than 1,000 are unwise choices for any community. The consensus clearly suggests that schools in impoverished communities should be much, much smaller.

Bradley and Taylor (1994) claim that if the school is too small, then:

1. there are subject choice restrictions;
2. it will be constrained to recruit generalist teachers, with little scope for specialisation (for both teachers and students);
3. there will be fewer grouping options;
4. teachers will have to do more administration; and
5. there will be fewer resources available.

On the other hand, if the school is too large, then:

1. there will be reduced or little contact between students and teachers outside the school;
2. they will be difficult to manage with an increased bureaucracy; and
3. the dangers of student (and teacher) alienation rise dramatically.

In a later analysis covering the years 1992 to 1996 and using the same attainment criterion, these authors (Bradley & Taylor 1998; Taylor & Bradley 2000) found "substantial statistical evidence of the presence of scale economies in the secondary school sector" (2000, p.147), and that "staff hours per pupil is highly significantly negatively related to both school size and to the capacity utilization rate of schools" (1998, p.146). Their detailed regression analysis showed that after controlling for school type, staff characteristics, family background of students and ethnicity, school size (and a school size quadratic) showed significant relationships to the attainment criterion. The negative quadratic indicated an inverted U (shallow) which peaked at around 1500 students, though there was not much difference between 1200 and 1800. These data are used to support an argument for larger schools and fuller utilization of each school's capacity through amalgamation. The social and cultural costs were not, however, factored in.

Barnett et al (2002) studied 152 secondary schools in Northern Ireland and found "a positive relationship between effectiveness-efficiency performance scores and secondary school size … across a range of educational outcomes." (p.291) However there was no control for prior attainments or SES, thus assuming that students are randomly assigned to schools on these two variables. Further, the school sizes were categorised into different sized groups, with the largest group being 1000 or more, hence much information is lost in the analysis.

The "Matthew" Project would indicate that socio-economic factors (to which one would want to add cultural considerations) turn school size into a variable which may be differentially evaluated, and which has a relationship to a sense of community that will vary from group to group. Hence notions of "small" and "large" cannot be treated as some sort of universal constants.

3. The primary sector

With regard to primary schools, there are numbers of studies showing that the strictures that might apply to secondary schools are not appropriate to assessing the impact of school size. For example, Hopkins and Ellis (1991) reviewed the situation in the UK, where they claim that the government regarded schools with fewer that 60 pupils as too small. For small primary schools, however, Hopkins and Ellis state that the difficulties are caused more by isolation and lack of resources than by a restricted number of teachers (p.118). Further they claim that small schools can be very effective provided that appropriate teaching methods and forms of classroom organisation are adopted, and that teachers need to be flexible and reflective in their approach. External support is essential and cooperation between schools can be very beneficial. Overall, they place a strong emphasis on the need for on-going professional development for teachers in such schools.

Francis (1992) studied 4,746 pupils in 192 schools and assessed the attitudes to school through a semantic differential scale. It was found that year 4 pupils at schools with fewer than 60 pupils have more positive attitudes to school than those at larger schools. However, the difference was not great and the samples were very badly out of balance (303 students in "small" schools, 4,443 in "not small" schools).

The Lee and Loeb (2000) study of 264 Chicago elementary schools (grades K – 8) defined a "small" school as one with fewer than 400 students. There were 25 such schools in their study, a further 143 between 400 and 750, and 96 with more than 750 (3 with more than 1500). They looked at the correlates of these size groups in three areas: teachers' attitudes; student learning; and the relationship between teachers' attitudes and student learning. They used a multi-level analytic technique (HLM) within a "school effects" approach. They found that the small schools enrolled fewer low-income students, and that the collective responsibility for the schools' work was much higher amongst the teachers at the small schools. In terms of Mathematics achievement they found a positive effect size in favour of the small schools. Positive teacher attitudes were also related to higher achievements by students. Their overall conclusion was that the size of the school affected student achievement in two ways: via a direct effect (effect size of 0.54 when compared to medium schools, 0.31 compared to large); and an indirect effect through teachers' attitudes (0.10 when compared to medium, 0.14 with large schools); for total effects when compared to medium and large schools of 0.64 and 0.45 respectively. The authors also pointed out that hidden within the direct effect would be a host of other correlates not measured in their research, such as social relationships within the school, disciplinary regimes, school-community relationships and so on. After a careful analysis of the issues surrounding their findings, they concluded that they "provide empirical support for a move to small elementary schools." (p.26)

4. School size in New Zealand

A government review of the viability of small schools was conducted in 1991 (Ministry of Education, 1991) and concluded that "it is unlikely that there is a significant correlation between school size and educational effectiveness" (p.17). However, they added, "there is no New Zealand research available on this issue". The reviewers pointed out that "small" needs to be defined depending on whether one is dealing with primary, intermediate, area, or secondary schools (pp.10-11). Further, they add that the concept of smallness and its significance in any evaluation with regard to educational outcomes "is determined by a combination of social, educational, economic and community factors" (p.13). It appears that the Government was looking to save money, and a minority report by the Treasury and State Services Commission representatives on the review panel was attached as part of the Report (Appendix GG). This Appendix strongly advocated the bulk funding of all schools. They wanted

> responsibility for viability, and control over the factors that effect that viability, devolved to each Board … [which if it] could not cope on the mostly roll driven funding it would receive would have the option of becoming more efficient, closing, or shifting more of the resource burden onto parent and/or the community.

In clear disagreement with this "user-pays", market forces philosophy, were the views of all those who made submissions to the review panel. In the review of these 1800 submissions (Appendix AA), the Panel reported that they were "unanimous in their support for the retention of small schools". It was pointed out by many of the submissions that the social and community role of small schools in rural areas more than compensated for the extra costs involved. In this way the Panel concluded that the social and community function of small schools was always left out of the calculations of costs and benefits as it is not easily translated into dollars and cents. As one submission put it "The *kaupapa* that applies to supermarkets cannot apply by direct transfer to schools".

4.1 Primary sector

When looking at the relationship between school size and attainments in New Zealand, researchers are constrained by the lack of any universal attainment criteria that are applied to all students at any particular age level. However, since 1995, the National Education Monitoring Project (NEMP), using a substantial representative sample of students at years 4 and 8, encompassing 15 curriculum areas using a wide range of assessment tasks (i.e., not just "paper and pencil" tests), provides excellent data for secondary analysis. This would need to be our main source of research findings, as there are a number of problems with expecting overseas studies to throw more than a general light on New Zealand schools. For example, at the primary level, the findings from Chicago (Lee & Loeb, 2000) would be difficult to assess since their definition of a small school (<400 students) would include 88.2 % of New Zealand mainstream and Kura primary schools, where, in 2001 the median size of the 2074 schools was 143, and the 90^{th} percentile was at 424. (See Figure 1a). In New Zealand an Educational Review Office report (ERO, 1999) defined "small" schools as those with fewer than 150 students (over half of all primary schools, 51.6%), "smaller" schools as those with between 26 and 50 (13.6 % in 2001), and "very small" schools as those with fewer than 26 students (8.1 % in 2001). In relation to a number of output criteria, they reported that there were "good" and "bad" schools in all size groups. An analysis of five years of NEMP data (Crooks and Hamilton, 2001) using similar size categories, indicated that there was little difference in achievements that could be related to school size.

> Only 2 percent of the 500 or so assessment tasks, both at year 4 and year 8, showed statistically significant differences in performance for students from "small", "medium" and "large" schools. This is almost chance level, given that p = .01 was used as the critical level for most tasks and p = .05 for the remaining [group] tasks. (p.15)

4.2 Secondary sector

At the secondary level, up to 2001 (when a new qualification system was introduced), public examinations were held at years 11, 12 and 13. Not all students sat these examinations, but most were encouraged to do so. Aggregated results for these examinations are merged with other data in the MOE Indicators Baseline data set, and it is from these data for the year 2001 that the following analysis derives.

Figure 1b shows the distribution by roll size of all the 454 registered (State and Private) secondary schools in New Zealand. It is worth pointing out that this is the total population of secondary schools in New Zealand, hence there should be no sampling error. As with the primary schools, the distribution is quite strongly positively skewed, with a mean just under 600 and a median of 500. The standard deviation of 464 also reflects the skewness, being inflated by a small number of very large schools, which also pull the mean away from the median. The semi-interquartile range is much smaller at 304. In looking at the academic attainments of the schools in relation to size, and taking into consideration the skewness of the distribution, median splits (as in the "Matthew" Project) were rejected in favour of a finer grained division along lines suggested as appropriate by studies in other countries. Six size categories were generated to use in the analysis: below 300; 301 to 600; 601 to 900; 901 to 1200; 1201 to 1500; and over 1500. Category 3 (601-900) matches the "optimum" size range for secondary schools found in studies in England and America.

Table 1 shows the data for five Year 13 and one Year 11 attainment criteria broken down by the size groups. The Year 11 retention ratio (the number of Year 11 students divided by the number of Year 9 students three years previously) is also shown.

Table 1 about here.

Figures 2 to 7 show the distribution of schools against size and percentage of passes for their examination candidates across this range of output criteria in graphic form.

Figures 2-7 about here.

The median data in the first 5 columns of Table 1 show no sign of a U shaped distribution (inverted or not), and is quite consistent across all the attainment indicators. In Figures 2 through 6 (the Year 13 attainment measures) this is illustrated by the failure of a quadratic fit to improve in any substantial way the R squared figure, over that obtained with a linear fit. The amount of indicator variance accounted for by size is small (R^2 <.26 in all cases), and the figures show a much greater variability in the small size groups (reflected in the standard deviation figures in Table 1). The indicators used in Figures 2 - 6 are primarily for students in their last year of secondary schooling (Form 7 - Year 13). Figure 7 displays some data from the more general Year 11 examinations, which are from a much larger proportion of the student population than the higher level Bursary (Year 13) examinations, and show a similar linear distribution to the higher indicators – tilted in favour of larger schools. The Year 11 retention ratio data in Table 1 would seem to indicate that the larger schools may be growing at the expense of smaller ones through a process of "creaming" – that is, where students of ability will move to a larger school where more subject options are available, and, perhaps, more specialist teaching facilities and teachers are located.

There is strong evidence from the American "Matthew" Project that the optimum size of schools in promoting academic attainment was dependent on levels of community resources. Students from under-resourced communities were doing better in smaller schools, while students in well-resourced communities were not disadvantaged by larger schools. The next four Figures (8 to 11) examine this conclusion using the New Zealand data. Figures 8 and 9 show the scatter and regression fits that relate school size to attainments from Year 13 and 11 for TFEA Decile 1 to 3 schools, whose catchment areas cover the bottom 30 percent of communities in terms of resources. Figures 10 and 11 show the same data for TFEA Deciles 8 – 10, and show that students in such schools are not particularly disadvantage by large or small school sizes. As with the overall data, it is important to note the extreme variability of the small schools, some of which do better than any other schools. Clearly attending a small school is neither a necessary nor a sufficient condition to block high achievement in students. It should also be born in mind that in some of the small schools the number of candidates for the various public examinations can be quite small (or even non-existent in some years), hence the percentage figures could be based on only one or two candidates.

When looking at the data for Maori secondary students in relation to school size, Table 2 shows that Maori are more likely to be in a school with less than 900 students than is true for non-Maori – 65.7% compared to 48.4%. Unfortunately the data base does not contain separate data on examination results, but the qualifications of Maori leavers can be examined.

Table 2 about here

Figure 12 looks at the relationship between school size and attainments of Maori leavers from the secondary schools. At the highest level of qualification (Leavers with a Year 13 award) the relationship with size is very flat, showing no relationship to size. Note again that the variability in smaller schools is very large.

Figure 12 about here

By international comparisons, New Zealand primary and secondary schools, with the medians at around 150 and 500 respectively, are quite small. In addition, at the secondary level, the smallest size group contains a number of specialised institutions: some small private schools; a number of Maori medium Whare Kura; some state funded denominational schools; as well as isolated, rural composite schools that cover the whole year 1 to 12 range. This would seem to account for the greater variability exhibited in the results for the smallest (0-300) group of schools (see standard deviation data in Table 1), and reinforces the point that roll size as a salient factor in school attainments will vary depending on the nature of the student population. To counteract the effect that differing variances have on the mean, and the effect of a small number of very large "outliers", the median scores are also reported in Table 1 and show a more consistent linear pattern favouring the larger schools.

Taking the population of secondary schools as a whole, there is no strong indication of an optimum size of secondary school from these data. The relationship is very close to linear in form, and suggests no "tailing off" in schools that exceed 1500. For Decile 1-3 schools there is some indication that schools below 900 show somewhat enhanced outputs, but there would seem to be no support from these aggregated data for the "smaller is better" hypothesis for disadvantaged communities. The fact that the range of results for each size group overlap considerably, indicates that there is nothing "magical" about school size, since in every size group there are schools doing as well (and as poorly) as schools in any other size group. This is generally true for the schools serving well resourced communities (Figures 10 & 11), with some measure of support for larger schools on the more academic criteria. For Maori school leavers the pattern shows little or no relationship to school size on the qualifications of leaver variables.

4.3 Economic factors

In the Ministry's literature on "Network Reviews", little mention is made of the costs related to smaller schools. In Britain, unit costs of schooling were reported to rise steeply around 80 – 90 students (Francis, 1992). In New Zealand the MOE Indicators Database can be used to look at this issue. Tables 3 and 4 show the data for State primary and secondary schools respectively, with the per-pupils expenditure calculated by summing the operational grant and the salary grant, and dividing by the July roll return. The last column shows the distance of the median school in each size group from the overall median. Clearly at the primary school level the per pupil unit costs rise dramatically in schools below 50, which is somewhat lower than the 90 to 100 figure for Britain. At the secondary level, the per-pupil unit costs start to rise quite quickly below around 300-400.

Tables 3 and 4 about here

The data are shown graphically in Figures 13 and 14.

Figures 13 & 14 about here

The recent announcement by the Minister (MOE, 2004) of an extra $1 million (17 %) per year in boarding bursaries for students from remote areas can be quite quickly made up for from the closure of some small schools.These bursaries are $2,340 annually per student and are currently held by 2,650 students, and could be viewed as one of the "carrots" for the Network Review exercise.

5. Discussion

When looking at the New Zealand data there are a number of things that need to be taken into account when trying to interpret the results in relation to school size. As mentioned above, the quite heterogeneous nature of the schools in the smallest size category calls for a more careful examination of the schools in the category in relation to their effectiveness on the criteria used in this analysis. As with the research on class size, the variability within the size groups will be dependent upon the composition of the student population and the quality of teaching – see Hanushek (2003).

A second consideration is the relationship between size and the socio-economic backgrounds of the students attending particular schools, as measured by the TFEA Decile. For state and integrated schools the correlation is .345 (N=394), while for private schools (N=33) the correlation is .533. Thus higher SES communities tend to support larger schools. The fact that the Decile rating is strongly related to the output criteria being used in the analysis, along with school size, would almost certainly be distorting the picture with regard to school size by itself. The correlations are shown in Table 5, and indicate that the relationship between attainment levels and Decile is somewhat stronger than that between the attainment levels and school size.

Table 5 about here

A multiple regression of each of the indicators against size and Decile should help clarify the position. The data from these regression analyses are presented in Table 6, which shows that TFEA Decile is the stronger predictor on all of the output criteria, with some of the apparent relationship between size and various indicators being an indirect effect of the community SES background. However at the highest levels of academic attainment school size makes the strongest independent contribution in explaining the between school variance that the two variables account for between them. The independent effect of school size diminishes as the output criterion becomes more general, though as the t-test data show, it remains significantly different from zero for all of the criteria. The Beta coefficients are an indicator of net effect size. For example with the Bursary S/A criterion, a 1 standard deviation increase in school size (after control for Decile) is associated with .24 of a standard deviation increase in the dependent variable, compared with .48 of a standard deviation for each standard deviation increase in Decile after controlling for Size.

Table 6 about here

Overall the New Zealand schools, part of a single national system, with quite uniform curricula, teacher salary scales and systems of governance and management, do not show the same non-linear pattern of relationship between academic indicators and roll size that are to be found in America or the United Kingdom. What can be said from the data discussed in this paper is that:

- smaller schools are much more variable in the average attainments of their students than large schools;
- "effective" and "ineffective" schools are to be found in all sizes.

These data then, suggest that what happens within the schools (process) is more important than structural characteristics of the schools such as size. However, New Zealand schools are generally much smaller, and a better comparison might be fruitful if only state and Integrated schools from the largest urban areas were examined separately, since they will all be reasonably large schools, more directly comparable with the overseas examples examined above, and they will be subject to "market forces", since their student families will have exercised some choice as to which of the schools their off-spring attend. The results for the regression using 155 schools from the largest urban areas, are shown in Table 7. These data show that in urban areas, where choice of schools is a realistic option, the effect of size is the same for the A Bursary based on 4 passes and for the Year 11 retention criteria as for the total population of secondary schools. However, for the more general output criteria, the effect of size is attenuated even further, and the effect of Decile strengthened, indicating that in urban areas, school size adds little explanatory information to that already contained in the TFEA Decile rating.

Table 7 about here

Examining the scatter plots for these urban schools does not significantly change the conclusions with regard to optimum size – there is no clear indication of an optimum size in the urban schools. Most of the variability on all output indicators (and roll size itself) is associated with the decile rating of the school.

6. Conclusion

The research question that prompted this investigation (to determine if there is any research support for schools of any particular size at the primary or secondary levels in New Zealand as being more effective than schools of any other size) has received a generally negative response. While there are clearly some substantial cost savings to be made with the closure of smaller schools (or a shifting of the cost burden onto families), this would need to be balanced against the social and cultural costs to isolated and small rural communities struggling to attract families to work in the rural sector and where the school often represents the physical "heart" of the community and its social relationships. At the primary level, most New Zealand schools are small to medium by international standards, and the research evidence does not support any systematic relationship between student achievements and size differences within the New Zealand size range. At the secondary level the New Zealand data indicates that there is no "peaking" at an optimum size range as is reported in UK and USA studies, and indeed at the higher levels of academic outputs the relationship with school size shows few signs of "fall-off" in larger schools. However, it should be remembered that the analysis reported here only involved academic outcomes, and the picture may be quite different with other sorts of non-cognitive outcomes.

It should also be remembered that very large schools in the USA and UK are often to be found in low socio-economic areas, serving many disadvantaged students, while in New Zealand the largest schools are all mid to high decile schools which "skim off" many able students from the low socio-economic areas. Figure 15 shows the distribution of secondary school sizes by the Ministry's TFEA Decile rating to illustrate this point. As with the research on class size, the achievement differences within and between schools in different size categories, may well have more to do with the quality of teachers and the teaching process than with size as such. The data presented here also illustrate some of the dangers in assuming that relationships between structural and contextual variables and student achievements are independent of the jurisdiction or country from which the data were drawn.

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Table 1: Scores on attainment criteria by size group, 2001.

roll size groups		% with A Bursary >= 4 papers based	% UB papers scoring S or A	% UB papers scoring S, A, or B	% UB papers scoring S, A, B or C	Percent Leavers with F7 award	% SC Y3 papers scoring A or B	Year 11 re-tention ratio
< 301	Mean	8.26	7.96	27.88	64.79	22.91	22.90	70.87
	N	82	82	82	82	118	107	98
	Std. D	13.29	11.08	26.62	26.79	26.67	18.76	31.71
	Median	0.00	4.40	20.00	63.70	15.60	19.70	68.90
301-600	Mean	14.09	10.39	28.35	66.03	33.07	25.83	77.13
	N	126	126	126	126	129	128	127
	Std. D	12.88	8.73	14.84	16.48	23.13	13.66	19.13
	Median	12.90	9.40	28.70	68.50	27.70	22.20	77.60
601-900	Mean	21.19	13.59	34.49	71.00	39.17	29.09	83.24
	N	82	82	82	82	82	82	82
	Std. D	12.99	8.10	13.03	12.63	20.20	13.47	16.18
	Median	21.30	13.10	34.50	72.75	32.95	27.30	82.40
901-1200	Mean	22.30	14.48	37.78	73.20	37.60	29.91	84.06
	N	55	55	55	55	55	55	55
	Std. D	10.33	6.44	10.93	10.95	17.36	12.27	17.69
	Median	22.60	14.10	38.60	74.70	32.30	30.50	85.20
1201-1500	Mean	28.95	18.72	43.75	77.56	47.14	36.24	88.90
	N	27	27	27	27	27	27	27
	Std. D	12.59	8.67	12.27	11.36	18.97	15.58	12.30
	Median	29.30	17.30	43.30	78.60	42.60	34.50	88.80
> 1500	Mean	33.29	22.06	46.95	76.89	44.81	34.45	105.01
	N	20	20	20	20	20	20	20
	Std. D	14.53	8.77	13.19	15.23	17.96	14.47	48.71
	Median	35.25	22.85	49.25	80.60	46.70	36.65	97.40
Total	Mean	17.51	12.30	32.87	69.17	33.45	27.34	79.93
	N	392	392	392	392	431	419	409
	Std. D	14.48	9.58	17.93	17.98	23.67	15.49	25.07
	Median	16.90	11.05	33.00	71.75	29.40	25.00	81.80

Note: SC Y3 includes only those students sitting the examination in their third year at secondary school.

Table 2: Disribution of Maori and non Maori by school size, 2001

roll size groups	Maori Roll	%	Non-Maori	%	Total Roll	%
< 301	7451	15.9	13053	5.8	20504	7.6
301-600	12991	27.7	45152	20.2	58143	21.5
601-900	10384	22.1	50126	22.4	60510	22.3
901-1200	8944	19.0	49162	21.9	58106	21.4
1201-1500	4043	8.6	31967	14.3	36010	13.3
> 1500	3126	6.7	34549	15.4	37675	13.9
Total	46939	100.0	224009	100.0	270948	100.0

Table 3: State Primary schools - per pupil expenditure by size group

Size groups	Mean	N	Std. D.	Median	% of tot. Med.
LT 26	9927.88	149	3696.17	8866.57	111
26 - 50	5940.77	230	1042.84	5896.85	40
51-100	4725.75	297	876.25	4526.14	8
101 – 150	4404.60	196	934.40	4117.49	-2
151 – 200	4277.31	181	863.47	4012.45	-4
201 - 300	3952.58	262	609.02	3783.99	-10
301 - 400	3696.37	208	451.17	3585.02	-14
401 - 600	3515.17	194	412.96	3385.44	-19
601 - 900	3490.10	34	343.82	3430.69	-18
Total	4849.63	1751	2150.51	4187.78	

Table 4: State Secondary schools - per pupil expenditure by size group

size groups	Mean	N	Std. D.	Median	% of tot. Med
51-100	9314.63	2	292.88	9314.63	76
101 - 150	9007.67	4	2383.60	8325.73	57
151 - 200	8327.43	4	1463.86	7837.92	48
201 - 300	6874.14	15	462.93	6695.43	26
301 - 400	6427.59	23	484.36	6512.25	23
401 – 600	5783.67	55	582.60	5673.61	7
601 - 900	5308.69	56	441.34	5287.97	-0
901 - 1200	4803.05	48	274.95	4797.71	-9
1201 – 1500	4626.15	23	250.54	4580.43	-14
GT 1500	4332.57	19	228.55	4283.75	-19
Total	5516.35	249	1096.60	5299.72	

Table 5: Correlations between TFEA Decile rating, school size, and some attainment indicators.

	A Burs. 4+ pass	Bursary S or A	Bursary S, A or B	Bursary S, A, B, or C	F7 qual.	S.C. A or B pass	Yr 11 retention
Decile	.616	.555	.502	.470	.609	.637	.509
Size	.492	.257	.321	.234	.297	.318	.310

Table 6: Multiple regression coefficients for size and Decile, selected indicators, t-tests in brackets. (All schools)

Indicator	R Square	Beta for size (t)	Beta for Decile (t)
A Burs.4+pass	.480	.332 (8.593)	.514 (13.296)
Bursary S/A	.358	.236 (5.506)	.482 (11.232)
Burs. S/A/B	.291	.205 (4.543)	.440 (9.735)
Burs. S/A/B/C	.232	.111 (2.369)	.436 (9.281)
Leavers F7	.378	.093 (2.271)	.581 (14.222)
SC A or B pass	.414	.096 (2.403)	.606 (15.105)
Yr 11 retention	.286	.173 (3.881)	.457 (10.270)

Table 7: Multiple regression coefficients for size and Decile, selected indicators, State and Integrated urban schools only, t-tests in brackets. (N = 155)

Indicator	R Square	Beta for size (t)	Beta for Decile (t)
A Burs. 4+pass	.566	.346 (6.084)	.566 (9.966)
Bursary S/A	.429	.165 (2.562)	.587 (9.113)
Bursary S/A/B	.438	.161 (2.520)	.596 (9.322)
Bursary S/A/B/C	.516	.055 (0.923)	.700 (11.819)
Leavers F7	.373	-.009 (-0.141)	.614 (9.127)
SC A or B pass	.503	-.000 (-0.003)	.709 (11.828)
Yr 11 retention	.208	.181 (2.388)	.365 (4.814)

Figure 1a: NZ Primary & KKM School Sizes

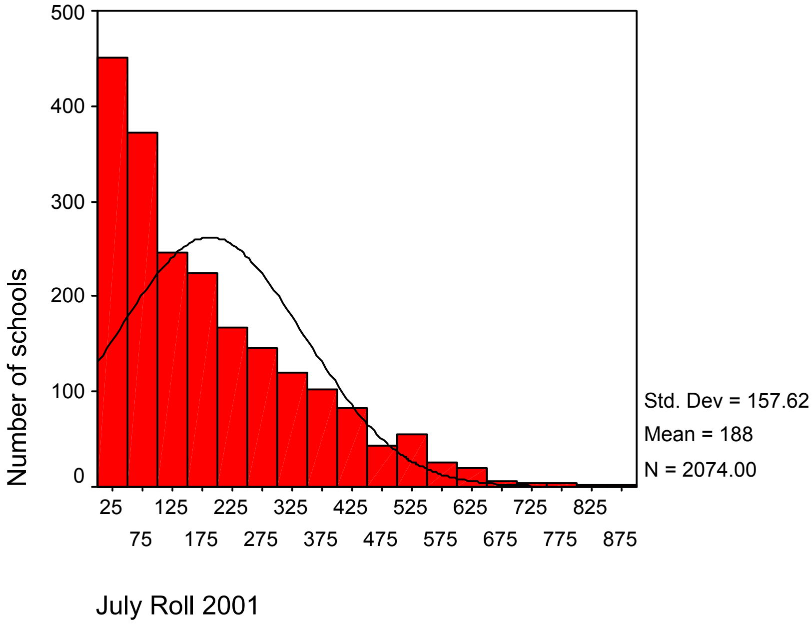


Figure 1b: NZ Secondary School Sizes

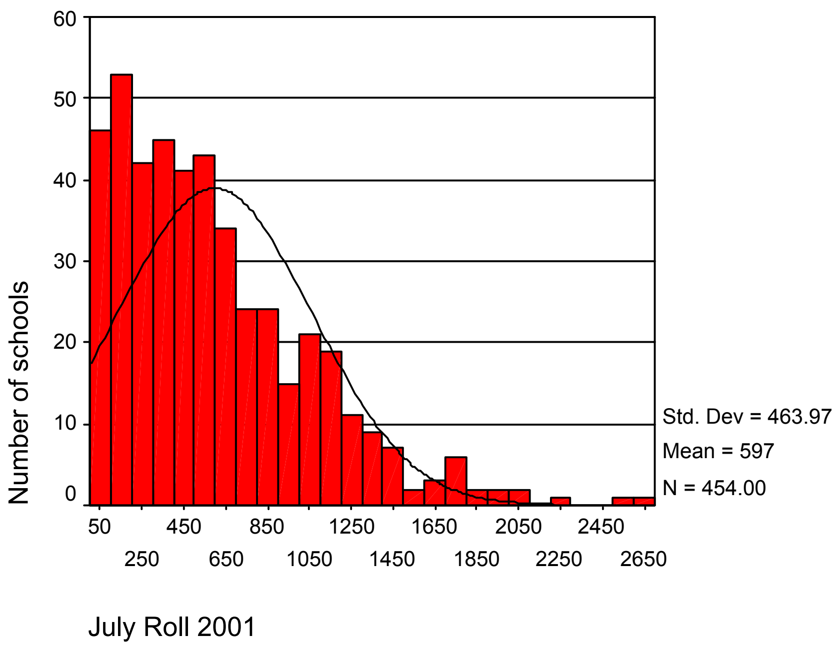
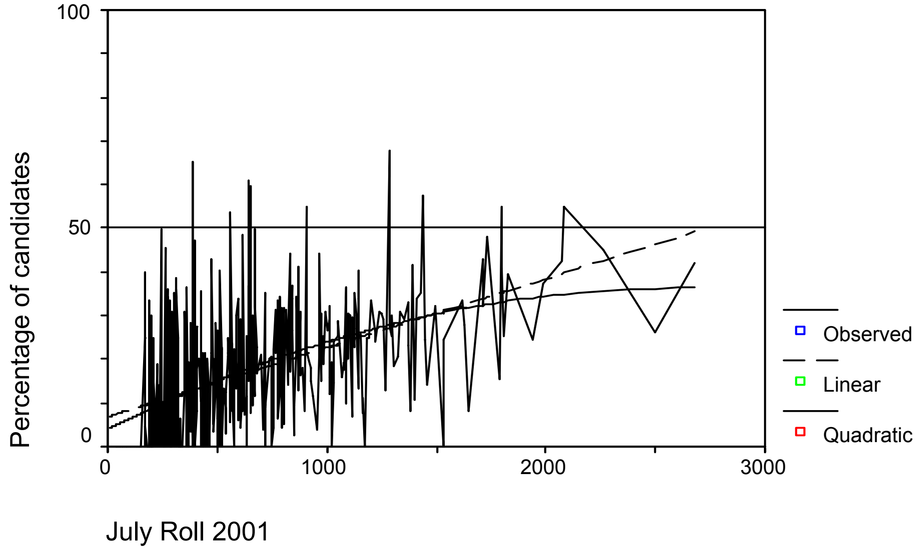


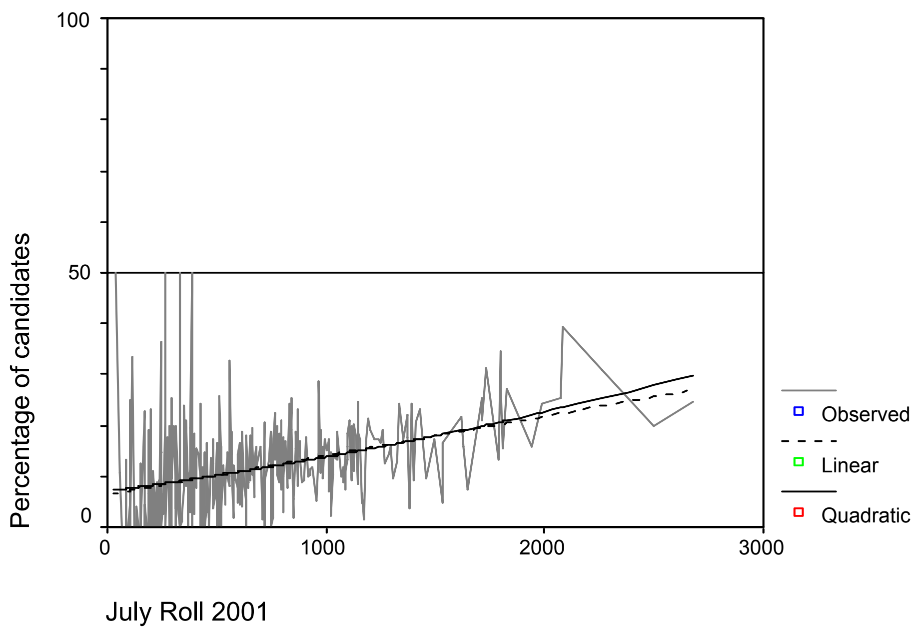
Figure 2: % with A Bursary:

from 4+ papers



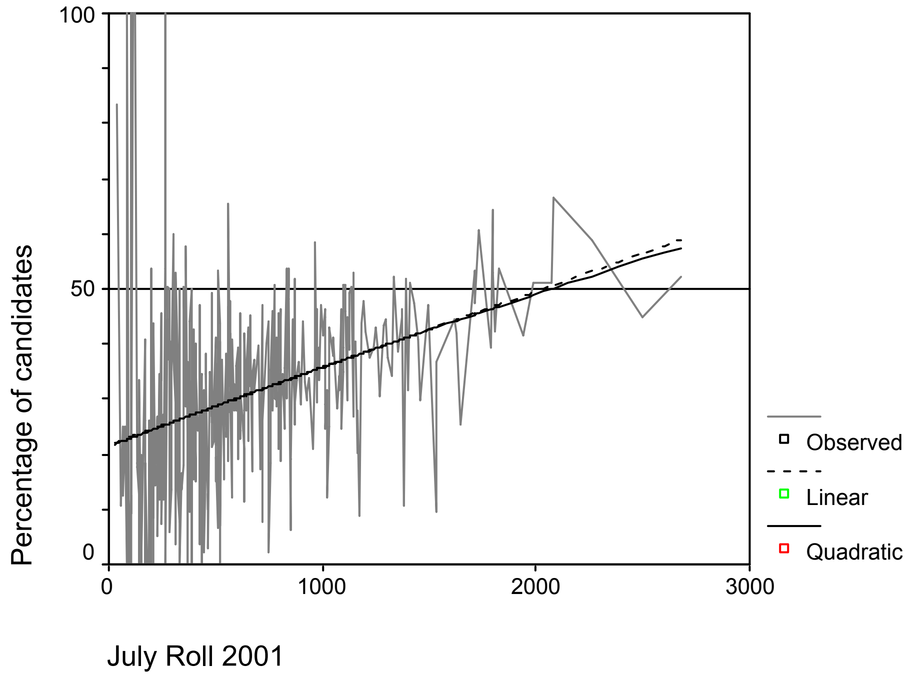
R^2 (linear) = .242 R^2 (quad.) = .252****

Figure 3: 2001% UB papers scoring S or A



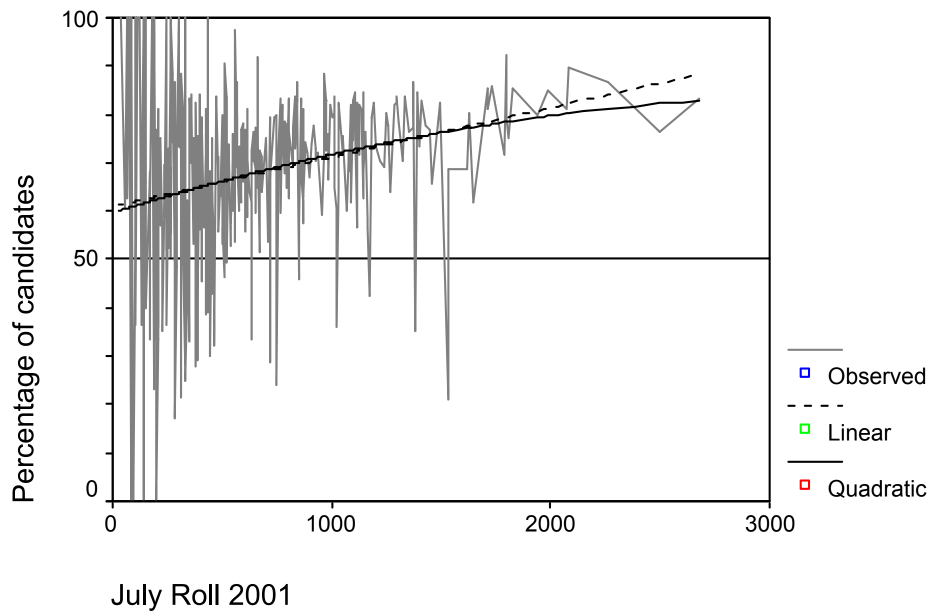
R^2 (linear) = .159 R^2 (quad.) = .161****

Figure 4: 2001% UB papers scoring S, A or B



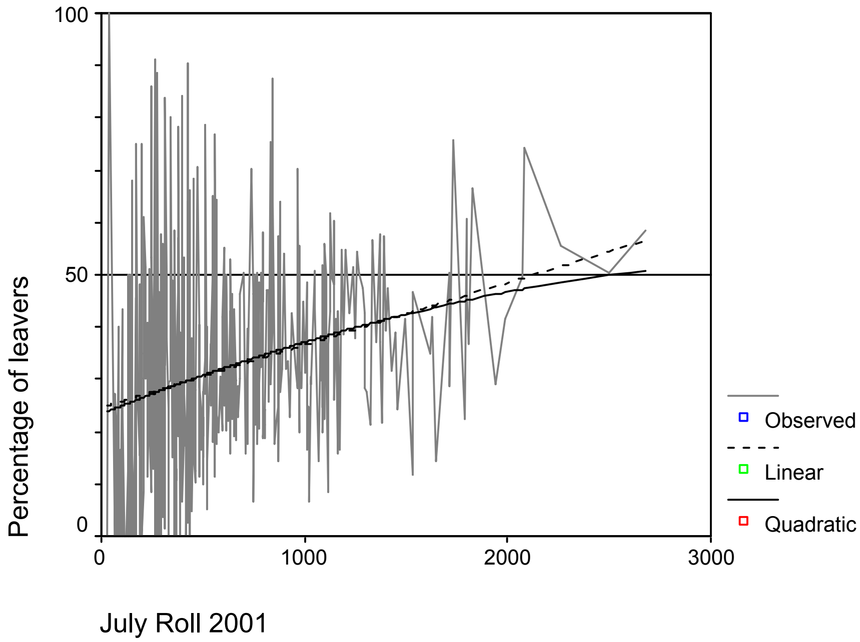
R^2 (linear) = .150 R^2 (quad.) = .150****

Figure 5: 2001% UB papers scoring S, A, B, or C



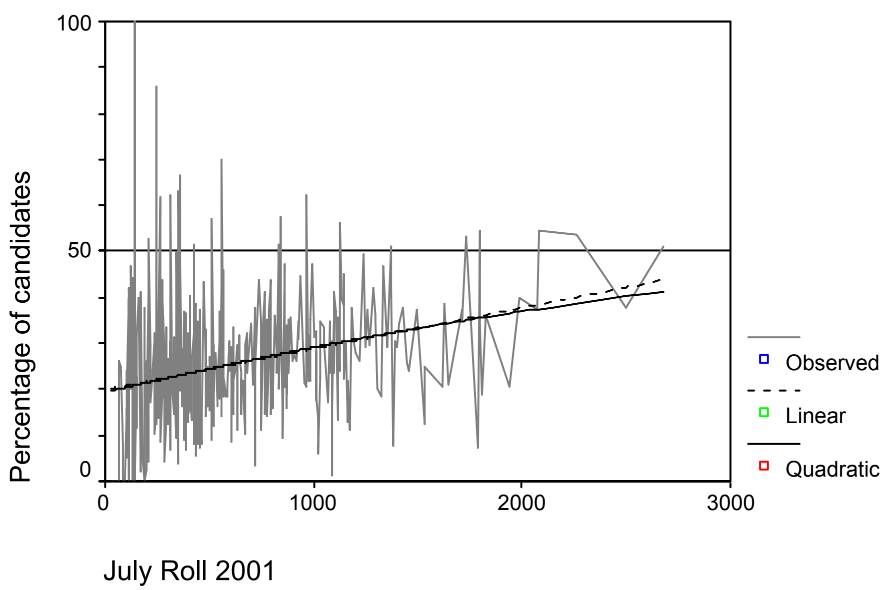
R^2 (linear) = .068 R^2 (quad.) = .070****

Figure 6: Percent Leavers with F7 award



R^2 (linear) = .071 R^2 (quad.) = .072****

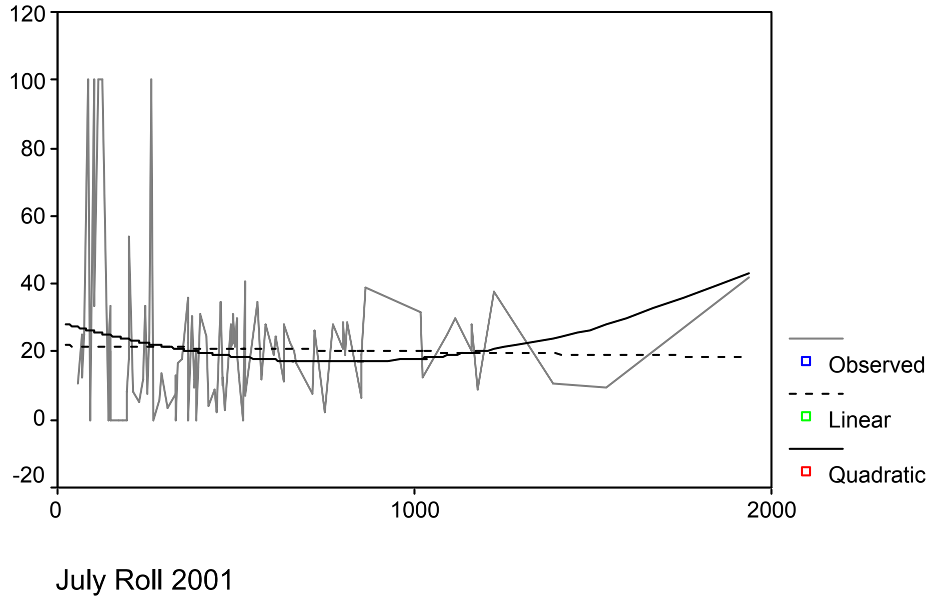
Figure 7: 2001% SC Y3 papers scoring A or B



R^2 (linear) = .084 R^2 (quad.) = .084****

Figure 8: 2001% UB papers scoring S, A or B

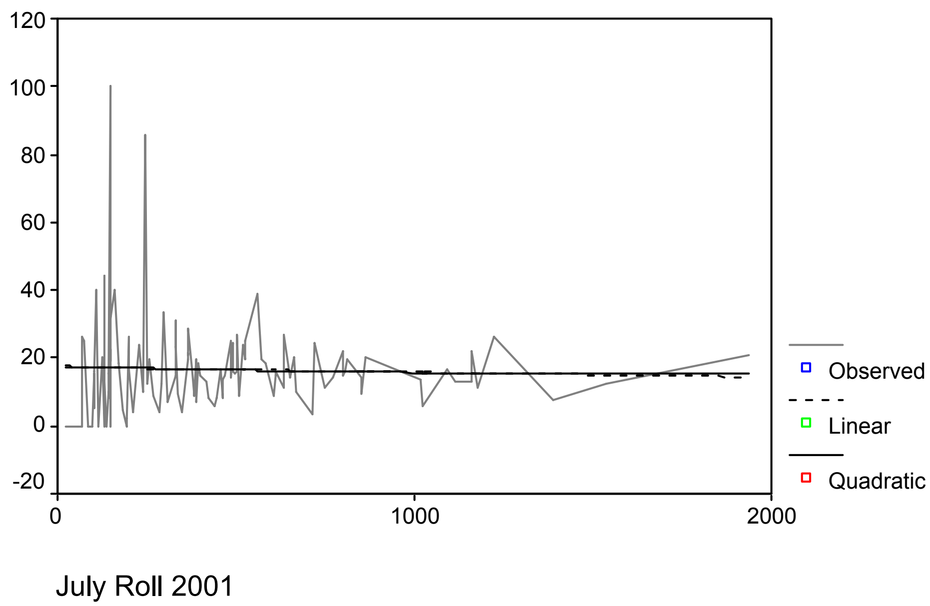
Deciles 1 - 3



R^2 (linear) = .001 **R^2 (quad.) = .036**

Figure 9: 2001% SC Y3 papers scoring A or B

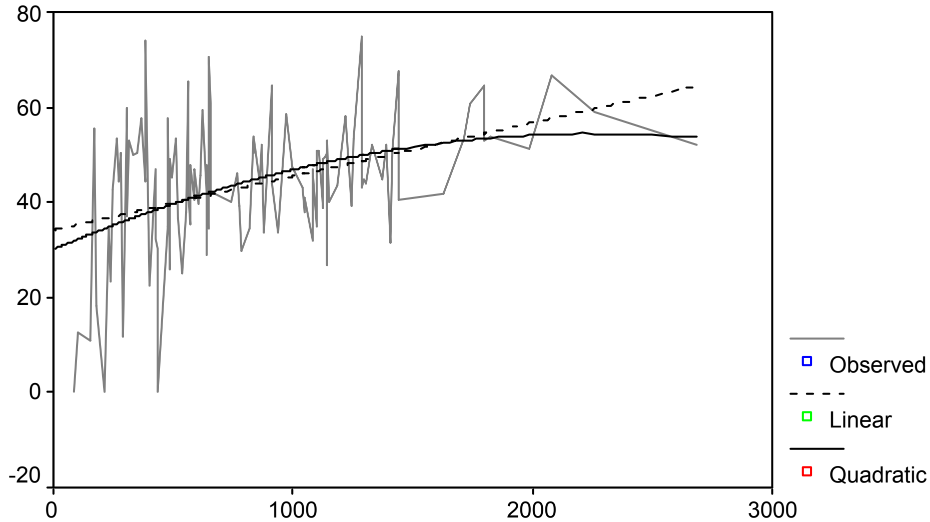
Deciles 1 - 3



R^2 (linear) = .001 **R^2 (quad.) = .001**

Figure 10: 2001% UB papers scoring S, A or B

Deciles 8 - 10

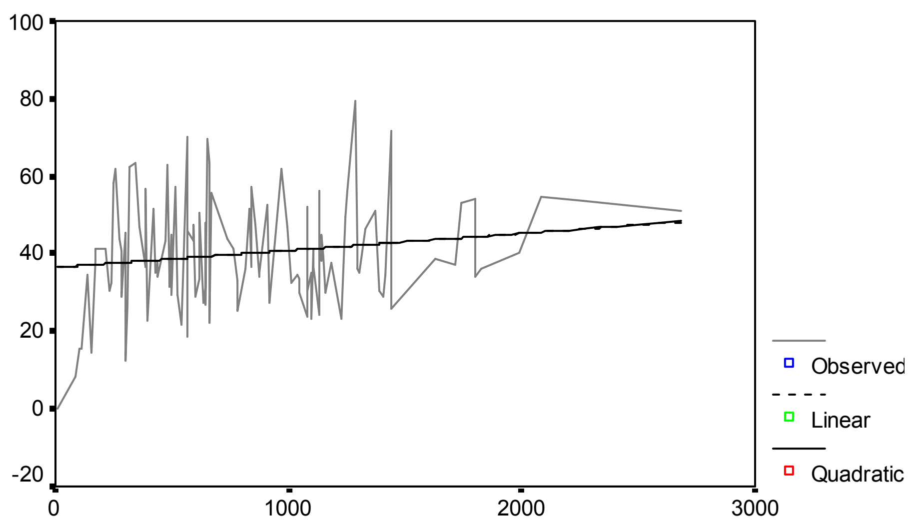


July Roll 2001

R^2 (linear) = .161** **R^2 (quad.) = .176****

Figure 11: 2001% SC Y3 papers scoring A or B

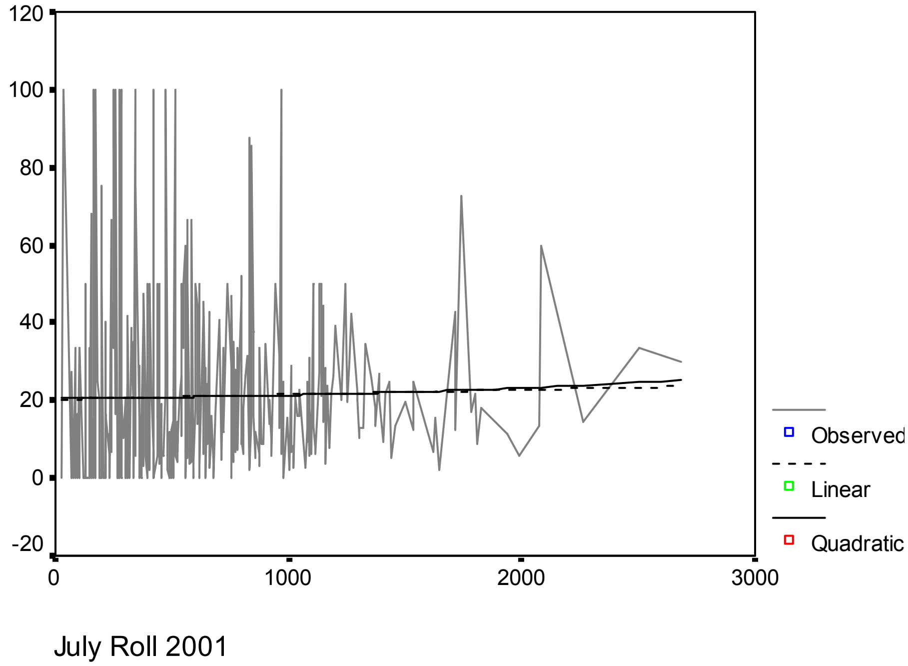
Deciles 8 - 10



July Roll 2001

R^2 (linear) = .027 **R^2 (quad.) = .027**

Figure 12: Percent Maori leavers with F7 award



R^2 (linear) = .001 **R^2 (quad.) = .001**

Figure 13: Per-pupil cost by size

(Primary schools)

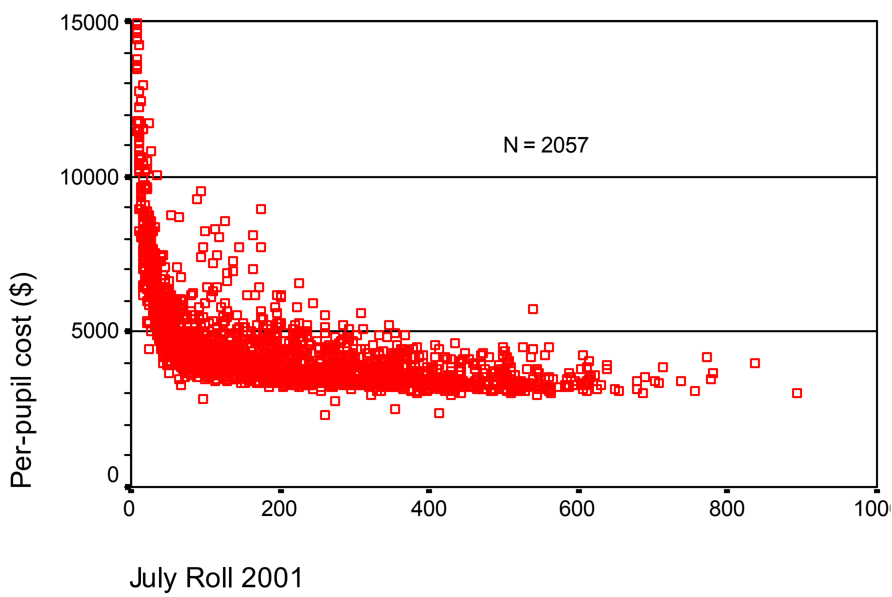


Figure 14: Per-pupil costs by size (Secondary schools)

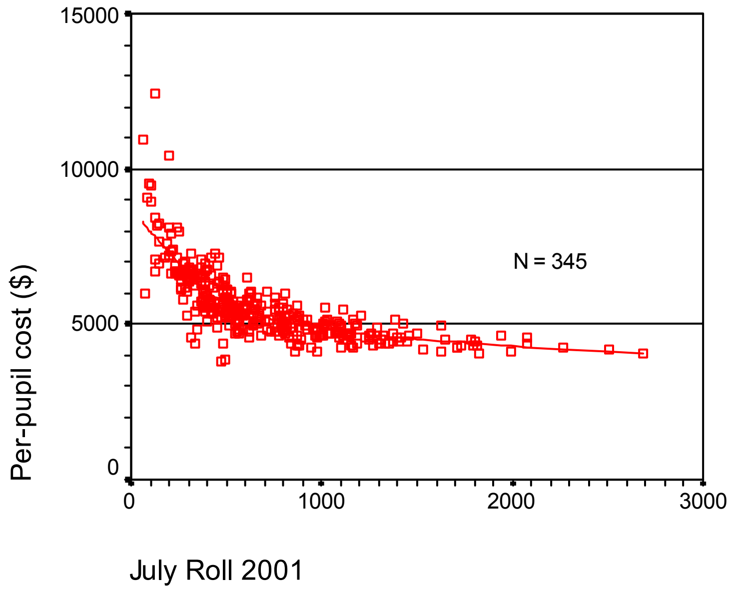


Figure 15: Secondary school size by TFEA Decile (2001)