Considering Weight Adjustments to Account for Concentration of Student Needs for the New Hampshire Commission Study of School Funding

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Introduction

Members of the New Hampshire Commission Study of School Funding have an interest in the important issue of concentration of student needs. Student needs clearly represents a key cost factor that takes a prominent role in the study conducted by the AIR research team. Specifically, in the three main empirical analyses performed by AIR (spending equity analysis, student outcomes risk analysis, and cost analysis) student needs proved to significantly correlate with spending per pupil, student outcomes and per-pupil cost of producing outcomes. Members of the Commission have brought up an important issue about the extent to which *concentration* of students needs matters.

Analysis of Relationship Between Cost and Student Needs Concentration

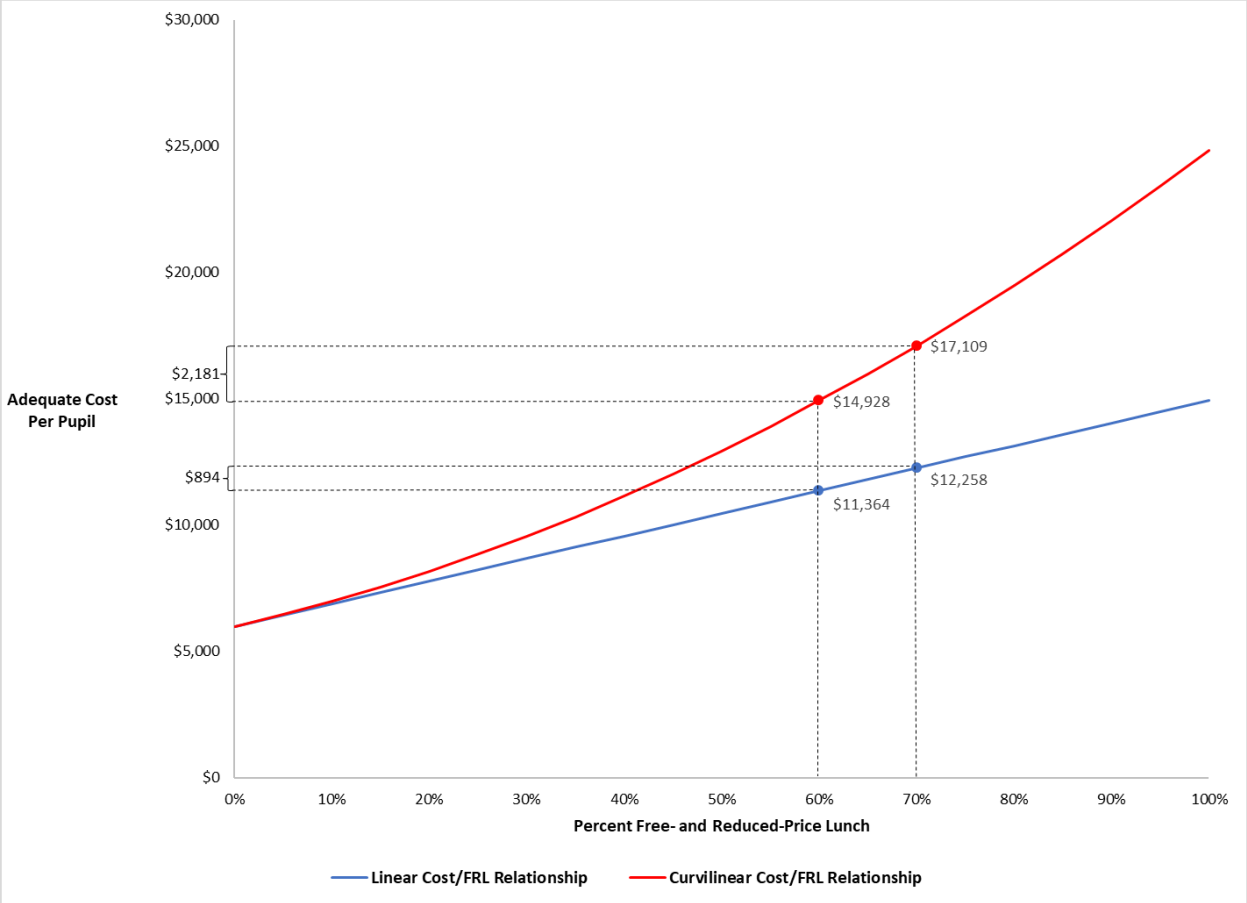
Linear Versus Non-Linear Relationships Between Cost and Student Needs

While it is clear that the spending necessary to provide an adequate educational opportunity for all students (aka adequate cost) increases with student needs such as the incidence of students eligible for free or reduced price lunch (FRPL), does the required spending increase in direct proportion (linearly) to the FRPL incidence rate? Alternatively, might the adequate cost be proportionately larger in districts with relatively higher concentrations of FRPL (i.e., might there exist a non-linear relationship between adequate spending and FRPL)?

Exhibit 1 illustrates hypothetical examples of these two types of relationships between adequate cost and FRPL. The linear relationship is depicted by the blue line, where the increase in adequate per-pupil cost is directly proportional to district incidence of FRPL. Specifically, for each percentage point increase in FRPL on the line the adequate per-pupil cost rises by $89. In contrast, for the non-linear (curvilinear) relationship depicted by the red line, the increase in adequate per-pupil cost rises disproportionally with FRPL incidence. Here, each successive percentage point of FRPL along the curvilinear relationship is associated with increases in adequate per-pupil cost that grow from $90 for a move from 0% to 1% FRPL to $286 for a move from 99% to 100% FRPL.

Compared to the linear relationship, the curvilinear relationship reflects additional responsiveness of adequate per-pupil cost to the concentration of FRPL. As an example, compare the difference in adequate per-pupil cost between a district with 60% and 70% FRPL under the linear and curvilinear relationships. The difference in adequate cost per pupil between the higher and lower FRPL districts using the linear relationship is $894, while the calculated difference in cost using the curvilinear relationship is over twice as much at $2,181. At lower levels of FRPL, using the linear and curvilinear relationships to make the same 10 percentage point comparison of student need (e.g., districts with 10% versus 20% FRPL) would result in far more similar increases in adequate per-pupil cost.[1]

Exhibit 1 – Example of Linear and Non-Linear Relationship Between Adequate Per-Pupil Cost and Incidence of Free- and Reduced-Price Lunch



[1] Specifically, in the example an increase in FRPL from 10% to 20% is associated with an $894 rise in adequate per-pupil cost using the linear relationship and a $1,191 rise using the curvilinear relationship.

Testing for A Non-Linear Cost/Need Relationship

In the analysis supporting the report submitted to the Commission, the AIR research team explored whether a non-linear relationship exists between per-pupil cost of providing opportunity for an adequate education and FRPL. This was done by testing specifications of the education cost function (ECF) that explicitly modelled the FRPL relationship as curvilinear. This involved including both linear and quadratic FRPL terms in the ECF in the model, a common way to model a curvilinear relationship. However, the coefficient for the quadratic FRPL term estimated using this model proved to be statistically indistinguishable from zero (statistically insignificant). In other words, we did not detect any significant non-linearity with respect to the relationship between FRPL and the per-pupil cost. We therefore concluded that there was no empirical basis for putting forward a funding adjustment factor that was sensitive to the concentration of FRPL. Rather, the results of the test for non-linearity supported the use of a linear FRPL funding adjustment.

Conclusion

The concern that districts with higher concentrations of student needs may require proportionately higher levels of resources to afford all students an equal opportunity for an adequate education is important to consider. It is for this reason that the AIR research team estimated specifications of the ECF model that explicitly tested for the existence of a curvilinear relationship between the spending necessary to provide an adequate educational opportunity for all students and FRPL. However, the results of the statistical modelling yielded no support for the hypothesis that there exists a curvilinear relationship between adequate cost and FRPL, which would suggest a funding adjustment that accounts for concentration of student needs. Instead, the findings indicated that there is a statistically significant linear relationship whereby higher levels of FRPL incidence are associated with directly proportionate increases in adequate cost.