WHAT CAN THE PUBLIC SCHOOL DO TO REDUCE DROPOUT NUMBERS?*

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INTRODUCTION

Rural youth who fail to complete high school often experience a great deal of difficulty when competing for available jobs. All rural youth cannot hope to find employment at satisfactory wage levels in the local community. Many must leave. It has long been known that economic mobility is highly related to the educational level of an individual. Dropping out of school at an early age poses a substantial deterrent to educational attainment and subsequent mobility.

It has been proposed that the number of dropouts can be reduced by pumping more money into the public schools. Educators have contended that inexperienced, poorly trained, and low-paid teachers often found in rural areas can lead to large numbers of dropouts. The analysis that follows was therefore designed to isolate determinants of dropout numbers from public schools. The model construes the formal educative process in a production function context as have other studies [1, 3, 4, 5, 7]. Minimization of the number of dropouts is assumed to be one of the goals of the local school administrator. Hence, the dropout rate is one possible measure of an output. Inputs to the production process consist of characteristics of the school and community believed to have an influence on a student's decision whether or not to stay in school.

The basic rationale for using dropout numbers as a measure of educational output is similar to the line of reasoning used to justify the use of scores on standardized tests of achievement as output measures.[1] Presumably, both the school and community can influence a student's decision whether or not to stay in school. If two school systems of the same size are located in communities of similar social and economic makeup, differences in the observed number of dropouts between the two school systems may be due to differences in characteristics of the school systems.

Clearly, minimization of dropout numbers is not the only objective of a local school administrator. However, it can be argued that keeping students in school is one of the goals of the administrator of any public school. Consequently, it is appropriate to assess the extent to which a school administrator can influence the number of dropouts by altering school input variables over which the administrator exerts direct control.

Specific hypotheses to be tested in the subsequent analysis are that:

1. Dropout numbers are lowest in school districts with teachers at high mean experience, degree and salary levels. High pupil/teacher ratios are associated with large numbers of dropouts.
2. Dropout numbers are lowest in high-income districts where a large proportion of residents have college degrees. Rural-urban differences in dropout numbers are also thought to exist.

THE MODEL

To test the hypothesis that characteristics of the school and community can influence the number of dropouts, a multiplicative "educational production

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[1] See, for example [1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12].

function" was estimated.[2]:

$$(1)\quad DROP = \alpha_0\, ENRC^{\alpha 1}\, DENS^{\alpha 2}\, PTRA^{\alpha 3}\, EXP^{\alpha 4}\, DEG^{\alpha 5}\, SAL^{\alpha 6}\, GFCO^{\alpha 7}\, INCO^{\alpha 8}$$

where

- DROP = The number of students in the school district that dropped out of school in 1970;
- ENRC = Total enrollment in the school district for 1970;
- DENS = Population density in the county in which the school district is located;
- PTRA = The pupil/teacher ratio in the school district;
- EXP = Mean experience of teachers in the school district;
- DEG = Mean degree level of teachers in the school district;
- SAL = Mean salary level of teachers in the school district;
- GFCO = Percent of persons over 25 in the school district who were graduated from college, and
- INCO = Mean family income for the school district.

Measures of school inputs are included in the equation as explanatory variables. The mean experience and degree levels of teachers in the district are included in order to test hypotheses regarding the relationships between these characteristics of teachers and the dropout numbers.

The mean salary level also is included as an additional measure of teacher characteristics, since it is sometimes asserted that schools with high salary schedules are able to attract teachers with special qualifications not measured by training and experience. Highly paid, well-trained and experienced teachers should lead to few dropouts. The pupil/teacher ratio, a proxy for class size, is a major determinant of the cost of an educational program. A low pupil/teacher ratio is expected to result in few dropouts. Schools with large total enrollments can be expected to have large numbers of dropouts.

Three socioeconomic variables also were included in the production function. Population density was used as a means of testing for possible rural-urban differences in the dropout numbers. It is proposed that families with high incomes will tend to produce students less likely to drop out of school than will low-income families. Children from low-income families may drop out of school at a very early age because they and their families place a high value on current, rather than future, income. Parents who are college graduates are expected to encourage their children to remain in school. Consequently, the percent of persons over 25 who are college graduates was included as an explanatory variable to act as a proxy for the value that parents place on an education.

DATA

Data for the analysis consisted of information from 264 public school districts in Indiana for the school year 1970-1971.[3] Data on dropouts were obtained from a statewide survey on dropouts conducted during the same school year. Socioeconomic data were obtained from the 1970 U.S. Census [10]. Socioeconomic data were for individual school districts, not city or county averages. Census data for townships were aggregated to obtain averages for individual school districts.

RESULTS

The multiplicative production function (1) was estimated by transforming the data to logarithms, and applying ordinary least squares to the transformed data. Ordinary least squares estimates of parameters of the model and associated standard errors are presented in Table 1, while simple correlations among variables included in the model are presented in Table 2.

The observed relationships between some of the school input variables and the dropouts were found to be inconsistent with a priori expectations. In this regard, the findings of the analysis are similar to the findings in recent studies in which achievement scores were used as output measures [2, 5, 7]. Regression coefficients on school inputs found to be significantly different from zero in some cases had signs opposite those suggested by theoretical considerations.

The pupil/teacher ratio was found to be significantly related to the dropout rate. However,

[2] The multiplicative functional form was chosen because it allows for diminishing returns to inputs. For example, a doubling of teachers' salaries likely would result in a less-than-equivalent reduction in dropout numbers.

[3] There are approximately 300 school districts in Indiana. The parameters were estimated using all school districts in Indiana for which information was complete.

Table 1. ORDINARY LEAST SQUARE ESTIMATES OF PARAMETERS OF A MULTIPLICATIVE PRODUCTION FUNCTION FOR THE PREDICTION OF A DROPOUT RATE

Independent Variables (All variables are Logrithms)	Dependent Variable is the number of students in the School District that Dropped Out of School in 1970 (DROP)	90 Percent Confidence Limits on Parameter Estimates
Intercept	6.72	---
Total Enrollment in the School District (ERNC)	1.30** (.05)	+1.22 to + 1.38
County Population Density (DENS)	.009 (.046)	-.067 to .085
Pupil/Teacher Ratio in the District (PTRA)	-.576* (.314)	-1.094 to -.058
Mean Experience Level of Teachers in the District (EXP)	.484** (.197)	+.159 to +.809
Mean Degree Level of Teachers in the District (DEG)	-.14 (1.12)	-1.99 to +1.71
Mean Salary Level of Teachers in the District (SAL)	-.857 (.777)	-.423 to +2.14
Percent of Population in District that Graduated from College (GFCO)	-.163* (.085)	-.303 to -.023
Mean Family Income (INCO)	-.869** (.378)	-1.493 to -.245
	R^2 = .79 F = 121.18 n = 265	

* = Significant at the .10 level, two tailed test
** = Significant at the .05 level, two tailed test

Standard errors are in parentheses.

the sign on the variable indicates that it was those school districts with the largest pupil/teacher ratios that ceteris paribus, had the lowest dropout rates. This finding has implications for educational finance, for it indicates that if the desired objective of the school administrator is to reduce dropouts, resources may need to be allocated to uses other than for reductions in the pupil/teacher ratio. Of course, the finding does not necessarily mean that school administrators desiring to minimize the number of dropouts can expand the pupil/teacher ratio indefinitely. Rather, within the range of the data, the

Table 2. **SIMPLE CORRELATIONS AMONG VARIABLES INCLUDED IN THE PRODUCTION FUNCTION FOR THE PREDICTION OF A DROPOUT RATE (ALL VARIABLES TRANSFORMED TO LOGARITHIMS)** [a]

	LENRC	LDENS	LPTRA	LEXP	LDEG	LSAL	LGFCO	LINCO	LDROP
LENRC	1.00	.54	-.05	-.05	.46	.62	.38	.46	.86
LDENS		1.00	-.02	-.34	.31	.47	.31	.70	.38
LPTRA			1.00	-.07	-.09	-.05	-.10	-.05	-.08
LEXP				1.00	.09	.25	-.17	-.45	.09
LDEG					1.00	.66	.45	.30	.36
LSAL						1.00	.36	.39	.51
LGFCO							1.00	.60	.19
LINCO								1.00	.23
LDROP									1.00

[a] An "L" preceeding the variable name code denotes a log transformation of the variable.

evidence suggests that schools with high pupil/teacher ratios had fewer dropouts than those with lower pupil/teacher ratios.[4]

The influence of the experience of teachers on the dropouts also was found to be inconsistent with anticipated results. The coefficient was significantly different from zero, but the sign was positive, not negative. These results indicated that school districts hiring or retaining teachers with the most experience are also those districts with the largest number of dropouts. The positive sign on experience is perhaps justified in that young (and inexperienced) teachers may be better able to relate to high school students than are older and more experienced teachers, and consequently are able to encourage students to remain in school.

Again, this finding has implications for resource allocation. If the school administrator's desired goal is the minimization of dropout numbers, evidence was not found to suggest that the school administrator needs to be concerned with retaining experienced teachers on the staff. In fact, it may be quite desirable for the administrator to hire a share of young and inexperienced teachers each year.

Mean degree levels were not found to be significantly related to dropout numbers. The coefficient on mean salary level was found to be negative and larger than the standard error, but not significantly different from zero at even the .20 level. The sign was, however, consistent with a priori considerations in that the schools with the smallest number of dropouts were found to be paying the highest salary levels.[5]

School districts with large total enrollments were found to have significantly higher dropout numbers than smaller districts. With total enrollment in the regression equation, population density was not found to be significantly related to dropout numbers. Of course, districts with large total enrollments tend to be located in urban areas.

A major determinant of the number of dropouts was found to be the percent of persons in the school district who had been graduated from college. Schools with low dropout rates, as anticipated, were located in communities in which a high proportion of the population had been graduated from college. The evidence supports the hypothesis that families in such areas have favorable attitudes toward education, and encourage students to remain in school.

Mean family income also was found to be related

[4] Variation in pupil/teacher ratios among Indiana schools is relatively low. Sample data had a mean value of 20.37 with a standard deviation of only 2.32.

[5] Additional analysis was conducted in an effort to determine why the signs on experience and the pupil/teacher ratio were inconsistent with a priori expectations. Observations were sorted in arrays according to pupil teacher ratios and average teacher experience. An effort then was made to determine if additional explanatory variables related to pupil/teacher ratios and teacher experience could be responsible for the unexpected findings. No additional variables were identified. A tabular analysis of the data also was conducted in order to determine if the factorialization of the data was sufficient to insure that the regression had the opportunity to estimate the effect of experience and the pupil/teacher ratio for various levels of the other variables included in the regression equation. The analysis revealed that factorialization of the data was sufficient.

to dropout numbers. As expected, schools located in high income areas were found to have significantly lower dropout rates than those located in low income areas, lending support to the contention that children from low income families leave school at an early age because a high value is placed on current, rather than future, income.

CONCLUSIONS

Two key conclusions follow from the evidence generated by the analysis. *First, little support was found for the belief that school administrators can affect the dropout rate by altering levels of school input variables over which they exert direct control.* This statement is, of course, true only within the range of data. Pupil/teacher ratios cannot be expanded indefinitely. Further, there certainly may be ample justification for the hiring of teachers with masters degrees other than to minimize a dropout rate. However, the basic findings of the analysis concur with a large number of recent studies in which little evidence has been found of relationships between major school input variables (pupil/teacher ratios, salary levels, and training and experience of teachers) and "conventional" output measures (standardized test scores) [1, 3, 4, 5, 6, 7, 8, 9].

Second, socioeconomic variables appear to influence dropout rates in a manner similar to that hypothesized. Clearly, a student's motivation and interest in staying in school primarily is conditioned not by the availability of inputs within the local public school, but rather by the characteristics of the student's family and community. As evidenced by the results of the analysis, the belief that the allocation of additional funds to public education will reduce dropout rates is largely unwarranted.

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