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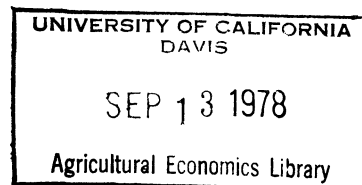
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MIGRATION IMPACTS ON INVESTMENT IN PUBLIC SCHOOLS:  
AN ECONOMETRIC STUDY OF WISCONSIN SCHOOL DISTRICTS

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## Abstract

### MIGRATION IMPACTS ON INVESTMENT IN PUBLIC SCHOOLS: AN ECONOMETRIC STUDY OF WISCONSIN SCHOOL DISTRICTS

If non-parents support education as an investment in social benefits, expenditures will decline as out-migration increases. This hypothesis was tested using Wisconsin school district data, gross migration rates, and single and simultaneous equation models. The results support the investment hypothesis and the need for explicit spillover compensation formulas.

MIGRATION IMPACTS ON INVESTMENT IN PUBLIC SCHOOLS:  
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In 1964 Weisbrod presented evidence that communities support public education as an investment in future social benefits, e.g. inculcation of acceptable social values, tax reductions due to net increases in tax collections from the higher income of students, or decreases in the level of public support required for welfare payments and other social programs. The subsequent theoretical debate resulted in contrasting conclusions on the efficiency and equity impacts of local financing of education. But all five participants accepted the hypothesis that non-parents support education as an investment in social benefits (Hirsch, Segelhorst and Marcus, Williams, Brainard and Dolbear, Hirsch and Marcus, and Pauly).

If a community supports education on an investment basis, it will attempt to provide the quantity of education that equates the marginal costs with marginal benefits to its local citizens. Since some of the social benefits spill out of areas experiencing out-migration, Weisbrod expected expenditures per pupil to be inversely related to the rate of out-migration.

Using data aggregated at the state level, Weisbrod found empirical support for the investment hypothesis. Empirical tests by Vincent and Holland, using SMSA school districts and regional data respectively, yielded conflicting results. In 1973 Holland and Tweeten suggested that school districts receive "spillover compensation" based on the level of net out-migration. Since the basis for providing "spillover

compensation" depends on the validity of the investment hypothesis, these conflicting results need clarification.

The purpose of this paper is to report the results of an empirical test of the investment hypothesis for public school support using a new data source and an expanded theoretical model. This research improves on previous tests by (1) using school district data for both urban and rural areas rather than state, regional or urban school district data, (2) including gross migration rates rather than net rates, and (3) developing and testing a model to examine simultaneity between expenditures and migration.

#### Determinants of Educational Expenditures

It is assumed that: (1) both private and social benefits are functions of educational outcomes or services, (2) educational outputs are a positive function of expenditures, (3) individuals try to select the expenditure levels which they feel will equate the marginal benefits from the educational outcomes associated with given expenditure levels with their marginal tax rates, and (4) some of the social benefits are geographically specific, accruing primarily or solely to the students' neighbors within the school district. These types of benefits are labeled "neighborhood benefits".

If students receiving public education migrate out of the neighborhood, many of the neighborhood benefits will spill over to their point of destination. If non-parents support public education as an investment in neighborhood benefits, the level of this support will decline as the rate of out-migration of students increases.<sup>1/</sup>

In contrast, expenditures will not increase as in-migration increases if the level of local expenditures has no influence on

the level of benefits spilling into the district. In summary, a negative regression coefficient is expected for out-migration in the expenditure function, while a zero coefficient is hypothesized for in-migration.

"Current operations expenditures per pupil from local sources" is a proxy for the level of local support for public education. The neighborhood benefit hypothesis predicts support will decline as benefits spill out of the district.

Gross out-migration and in-migration rates are proxies for the level of spillovers in neighborhood benefits. Unless net and gross rates of migration are highly correlated, gross rates are a better proxy for spill-outs and spill-ins than the net rates. (Weisbrod) Only net migration rates have been available prior to this study. Gross out-migration is estimated as the sum of the 1965 school district population, the number of in-migrants to the district from 1965 to 1970, and the district's natural increase in population from 1965 to 1970 minus the 1970 district population.<sup>2/</sup>

The 1960 educational spending function includes several other variables in order to remove potential bias in the estimates for the above variables.

One such variable is "income per student", a proxy for both the ability to pay and social preferences for education among higher income persons. A positive sign was expected for this variable.

The percentage of "non-local funds" includes state and federal aid as well as payments from other school districts. Since these non-local funds could either substitute for local funds or add to them, no a priori prediction was made for this sign.

The district's percentage of students in "non-public enrollment" is a proxy for demand for public versus voluntary non-public schools. As enrollments in non-public schools increase, less public support is expected, suggesting a negative coefficient.

"Secondary students" as a percentage of the school enrollment was included because secondary education is more expensive than elementary education. A positive regression coefficient was hypothesized.

The percent of the district's population which was "non-white" was a control variable. It may reflect racial bias in funding so a negative coefficient was expected.

Additional data were available for 1970 making it possible to control for several additional variables.

The "earning ratio of regional center to district" is the average annual earnings per person in the regional growth center to the average in the district. It is a proxy for the district's relative ability to pay and local attitudes about their wealth. A negative sign was predicted since districts which were wealthy compared to the regional center (i.e. low ratios) were expected to spend more on education.

"Educational attainment" is the mean number of years of education completed in those over 25. Support for public education was expected to be positively correlated with the level of educational attainment.

"Age of voters" is the mean age of persons over 18. The pay-off period for neighborhood benefits is inversely related to age, providing less incentive for older voters to support public education. Thus the mean age of voters was hypothesized to be negatively related to

expenditures.

"Student enrollment" is included as a proxy for economies of scale in school size. A negative sign was expected with a positive sign for enrollment squared. The number of "courses in high school" reflect the variety and depth of the program. It is assumed that costs increase as the number of courses expands.

Aaron suggested that public education may be supported as a "loss leader service" to attract new community members. The objective of this behavior is to reduce the per capita costs of other public goods and services with unexploited economies of scale. A dummy variable was used to identify small districts contiguous to SMSAs on the assumption that they were most likely to use education in this fashion. A positive coefficient was expected for these districts.

#### Empirical Results

Wisconsin school district data for both 1960 and 1970 was used to test this model.<sup>3/</sup> Table I presents the regression results with the first two columns reporting results for the model originally examined by Weisbrod.

The signs of the out-migration coefficients are consistent with the hypothesis that non-parents support public education as an investment in social benefits. The 1960 coefficient for out-migration was -5.26. This implies that a district with out-migration spent \$53, or 15 percent, less per child than the expected local expenditure. The coefficients for 1970 were considerably smaller (-0.27 and -0.31), leading to an average reduction of only \$3.15 to \$3.62 or less than one percent of the 1970 local current expenditures.<sup>4/</sup> The apparent

Table 1: REGRESSION RESULTS FOR CURRENT EDUCATIONAL  
EXPENDITURES FROM LOCAL SOURCES, WISCONSIN  
SCHOOL DISTRICTS, 1960 and 1970

|  | 1960 Data          | 1970 Data         |                     |
|--|--------------------|-------------------|---------------------|
|  |                    | Model I           | Model II            |
| Gross Out-Migration Rate<br>(% of 1965)          | -5.26<br>(2.0542)* | -0.27<br>(0.8116) | -0.31<br>(0.7871)   |
| Gross In-Migration Rate<br>(% of 1965)           | 2.27<br>(0.8979)   | 1.98<br>(5.2477)  | 0.72<br>(1.7804)    |
| Secondary Students (%)                           | -2.36<br>(2.3957)  | -5.17<br>(6.5098) | -0.03<br>(0.9813)   |
| Non-White (%)                                    | 4.23<br>(1.4424)   | 1.15<br>(2.4219)  | -0.04<br>(1.1315)   |
| Income/Student (\$)                              | -0.29<br>(1.1216)  | 0.02<br>(14.9456) | 0.02<br>(7.4968)    |
| State & Federal Aid (%)                          | -5.30<br>-4.66     | -0.66<br>(2.9463) | -0.98<br>(4.5609)   |
| Non-Public Enrollment (%)                        | 0.22<br>(0.7805)   | 1.15<br>(2.4218)  | 1.81<br>(4.9527)    |
| Earnings Ratio of Regional<br>Center to District |                    |                   | -26.71<br>(1.9331)  |
| Educational Attainment<br>(years)                |                    |                   | 41.69<br>(6.4621)   |
| Age of Voters<br>(years)                         |                    |                   | -27.07<br>(1.3088)  |
| Age Squared                                      |                    |                   | 0.31<br>(1.3709)    |
| Student Enrollment<br>(Average Daily Membership) |                    |                   | -0.01<br>(0.5170)   |
| Enrollment Squared                               |                    |                   | -0.12-6<br>(1.3219) |
| Courses in High School<br>(#)                    |                    |                   | 0.29<br>(6.9278)    |
| "Loss Leader" Community                          |                    |                   | 22.19<br>(2.6740)   |
| R <sup>2</sup>                                   | .586               | .748              | .781                |

\* t-values are in parenthesis.

reason for this change is the sizable increase from 1960 to 1970 in state and federal aid to local school districts. In 1970 the districts received an average of 47 percent of their total expenditures from state and federal aid compared to 27 percent in 1960.

In both 1960 and 1970 the in-migration coefficients were positive. However, the 1970 in-migration coefficient falls from 1.98 in model I to 0.72 in model II. The model I results are due to the correlation between in-migration and the omitted educational attainment variable.

Thus, the empirical results appear consistent with the neighborhood benefit hypothesis. Expenditures do fall as the out-migration rate increases as hypothesized by a model that views public support for education as an investment in social goods. The in-migration coefficient was positive rather than zero but it may be reflecting other characteristics of in-migrants similar to educational attainment.

For the control variables used in 1960 and for model I of 1970, only income per student in 1970 had the hypothesized sign.<sup>5/</sup> These results were similar for the 1970 model II. In model II the expected coefficients were found for educational attainment, voter age, loss leader districts, courses in high school and student enrollment.

Weisbrod's assumption that there would be no relationship between expenditures and migration is more likely to be correct when the test uses state or regional data rather than school district data. Tiebout suggested that people tend to select communities where their preferences for public goods are best satisfied. The Tiebout hypothesis suggests that taxpayers may migrate to school districts which provide the mix of expenditures and taxes they prefer.<sup>6/</sup> In addition, education may

increase the rate of out-migration by increasing students' ability to compete in non-local labor markets. In this study the Tiebout hypothesis is incorporated by assuming that out-migration is inversely related to local support for education and assuming in-migration is positively related to expenditures.

Since in and out migration might be a function of expenditures, a simultaneous equation model was estimated to minimize simultaneity bias. These results indicate that migration is not a function of local expenditure levels so the single equation results are not biased.

#### Implications for Alternative School Financing Programs

Since the empirical results suggest that the investment hypothesis may be correct, this implies local financing will tend to lead to both geographic inequalities and lower expenditures in areas of heavy out-migration. Based on the principle of benefit taxation, Holland and Tureen have argued that areas receiving spill-ins of human capital should compensate the areas losing this human capital.

The primary objective of the Holland-Tureen proposal is to provide geographical equity in the support of public education. In other words, they attempt to geographically distribute the cost of education in the same fashion as the social benefits are distributed. While this research supports the hypothesis that expenditures will vary with migration, the 1970 impacts in Wisconsin were relatively small. It appears that in 1970 the Wisconsin and federal aid programs had internalized these spillovers. Since neither the Wisconsin state aid nor federal aid programs explicitly compensate districts for educational spillovers, the internalization is occurring only by accident. If state and federal aid formulas do not explicitly recognize educational

spillovers, the accidental internalization might not continue.

If explicit spillover compensations are made, how should they be determined? Holland and Tweeten suggest that an area be allowed to reduce its expenditures by the same percentage as its net out-migration. Compare this with the compensation implied by the regression results of Table I. For example, assume that a district had a gross out-migration of 14 percent and gross in-migration of 7 percent for a net out-migration rate of 7 percent. Using the 1960 regression coefficients in Table I, this district would have spent \$57.75 less in 1960 than without any migration, requiring a compensation of \$57.75. The Holland and Tweeten proposal would have provided compensation equivalent to 7 percent of the \$362 expenditure per pupil or \$25.36. In contrast, the compensation implied for 1970 by model II regression results for the same district would be a \$-0.70 while the Holland-Tweeten proposal would provide compensation of \$51.81. So while there is a need for explicit spillover compensation in education, additional research is needed on the exact nature and magnitude of the spillovers and spillover compensation.

## Footnotes

- 1/ If a non-parent expects to leave the district during the period when neighborhood benefits would be realized from his previous investment in education, then this hypothesis implies he would have less incentive to support schools. Consequently, this hypothesis implies that out-migration rate of non-parents will be also negatively related to educational spending. Empirically, we cannot separate the migration rates for students, parents, and non-parents. In part, it is not necessary to separate parents and non-parents because all parents are also "non-parents" for their neighbors' children. For additional discussion of the theoretical model, see Weisbrod, Pauly or Morse.
- 2/ Data to estimate gross out-migration came from several sources. The district's 1970 population and in-migration from 1965-1970 were provided by the School District Data Tape issued by the National Center for Educational Statistics. The 1965 district population was estimated as the product of the 1965 student enrollment and an adjusted 1970 ratio of students to population. Natural increase in the district was assumed to be equal to the rate for the county in which the district was located.
- 3/ The 1960 data are from Geiken for the 83 Wisconsin K-12 school districts with at least 2,500 population. The 1970 demographic data on each district is from the 1970 Census Fourth County School District Data Tapes. This included data on educational attainment, earnings, age, income, population and in-migration. Remaining data came from the Wisconsin Department of Public Instruction. (Fonstad)

- 4/ The t-value for the 1970 out-migration coefficients shows they would not be significant at the 90 percent level. However, the entire population of school districts is included in these tests so the standard interpretation of t values is not relevant. They are shown merely to illustrate the dispersion in response.
- 5/ The 1960 income variable is actually income taxes paid per student. This may account for these unexpected results.
- 6/ Oates found that property values were negatively related to tax rates but positively related to school expenditures, thus providing some support for the Tiebout hypothesis.

#### REFERENCES

- Aaron, H. J. "Local Public Expenditures and the 'Migration Effect'", Western Economic Journal. Vol. 7, No. 4, Dec. 1969, pp. 385-390.
- Brainard, William C. and F. Trenery Dolbear, Jr. "The Possibility of Oversupply of Local 'Public' Goods: A Critical Note," Journal of Political Economy. Vol. 75, Feb. 1967, pp. 86-90.
- Fonstad, Clifton. Planning for Better Education in Wisconsin: A Guide for Agency School Committees - 1969-70 Information Supplement. Division of Field Services, Wisconsin Department of Public Instruction, Madison.
- Geiken, Lloyd Amling. "An Analysis of Selected Socio-Economic Factors which Influence Expenditures for Education in 100 Wisconsin School Districts", Unpublished Ph.D. dissertation, Educational Administration, University of Wisconsin, Madison, 1965.
- Hirsch, Werner Z. and Morton J. Marcus. "Intercommunity Spillovers and the Provision of Public Education", California University, University of Los Angeles, Institute of Government Public Affairs, Mimeographed report, 1969.
- Hirsch, W. Z., E. W. Segelhorst, and M. J. Marcus. Spillover of Public Education Costs and Benefits, L.A.: University of California Press, 1964.
- Holland, David William. "The Impact of Benefit Spillovers upon Economic Efficiency in Public School Finance", American Journal of Agricultural Economics, Vol. 56, No. 2, May 1974.

- \_\_\_\_\_ and Luther G. Tweeten. "Human Capital Migration: Implications for Common School Finance", Land Economics. 1973, pp. 277-284.
- Morse, George. "The Neighborhood Benefit Investment Hypothesis for Public Education: An Econometric Study for Wisconsin School Districts", Unpublished Ph.D. dissertation, University of Wisconsin, 1975.
- Oates, Wallace. "The Effects of Property Taxes and Local Public Spending in Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis", Journal of Political Economy. Vol. 77, December 1969, pp. 957-971.
- Pauly, Mark V. "Optimality, 'Public' Goods, and Local Governments: A General Theoretical Analysis", Journal of Public Economics. 1970, pp. 572-585.
- Tiebout, C. "The Pure Theory of Local Expenditures", Journal of Political Economy. Vol. 64, October 1956, pp. 416-424.
- Vincent, Phillip E. "Public Expenditure Responses to Public Benefit Spillovers", Paper presented at the Winter Meetings of the Econometrica Society, New Orleans, Louisiana, December 28, 1971.
- Weisbrod, Burton A. External Benefits of Public Education: An Economic Analysis. Princeton University, Princeton, N. J., 1964.
- Williams, Alan. "The Optimal Provision of Public Goods in a System of Local Government", Journal of Political Economy. February, 1966, pp. 18-33.